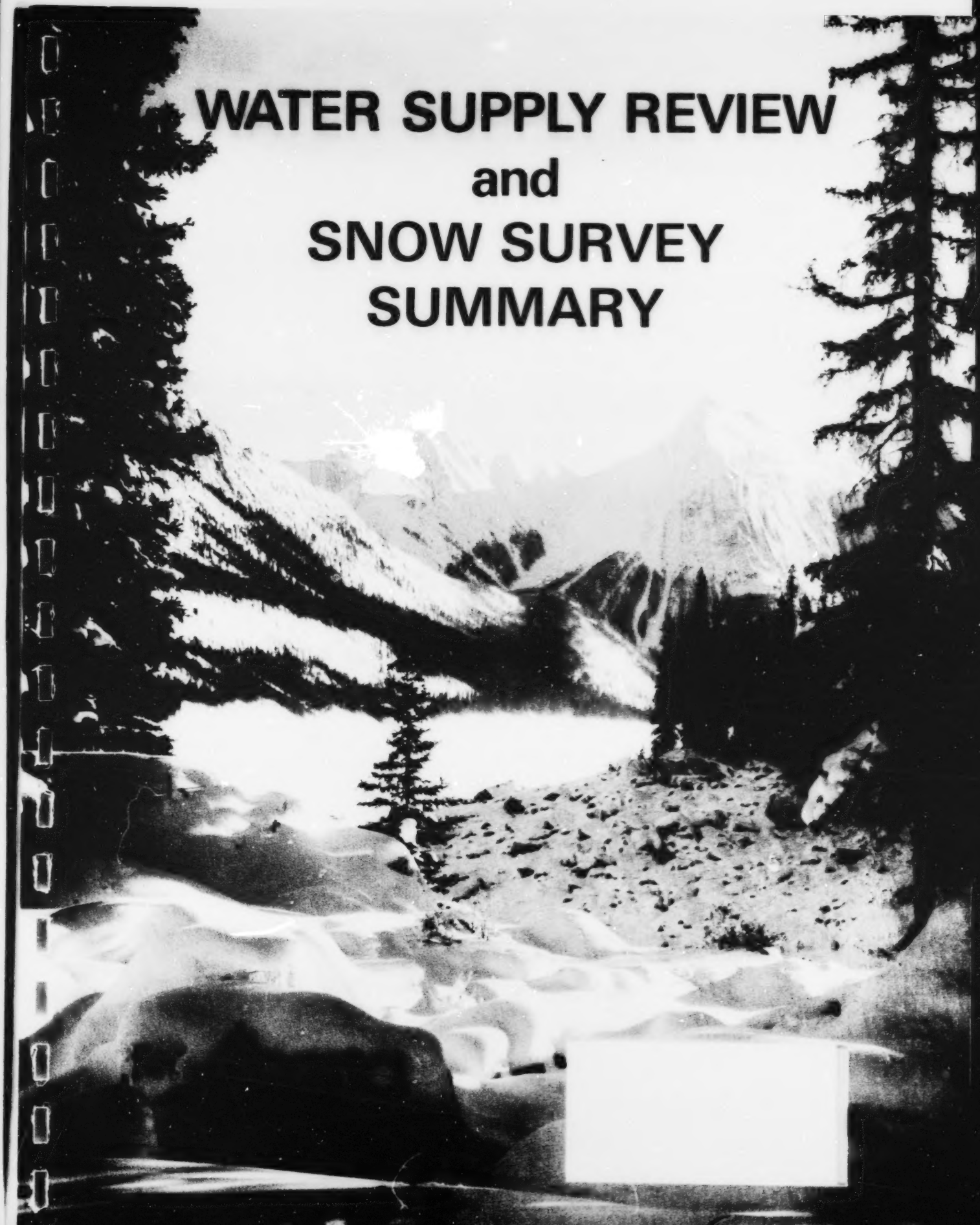
WATER SUPPLY REVIEW
and
SNOW SURVEY
SUMMARY



Alberta
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WATER SUPPLY REVIEW
and
SNOW SURVEY
SUMMARY

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Water Resources

Prepared by:

RIVER FORECAST CENTRE
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SURVEY BRANCH
TECHNICAL SERVICES DIVISION
WATER RESOURCES MANAGEMENT SERVICES

1983 – 1984

COVER PHOTO
ALBERTA GOVERNMENT PHOTO

WATER SUPPLY REVIEW AND SNOW SURVEY SUMMARY
1984

Alberta ENVIRONMENT

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WATER SUPPLY REVIEW AND SNOW SURVEY SUMMARY

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NOTES

The Water Supply Outlook and Snow Survey Bulletin is published four times each year in March, April, May, and June. Water Supply Updates are published in July and August. An annual Water Supply Review is also produced.

The River Forecast Centre and the Survey Branch of Alberta Environment acknowledge the assistance of Alberta Energy & Natural Resources (the Alberta Forest Service) and Environment Canada (Water Survey of Canada and the Atmospheric Environment Service) in providing precipitation and streamflow data for this report.

The streamflow hydrographs and the natural flow data presented in this report are based on tentative hydrometric records which are subject to revision.

The snow survey data and Sacramento Storage Gauge data presented in Appendix A are final data which are not subject to change.

Units of Measure

Parameter	Units of Measure (metric)	Conversion to Imperial Units
Snow Depth	centimetres	2.54 cm = 1 inch
Water Equivalent	millimetres	25.4 mm = 1 inch
Elevation	metres	1 m = 3.28 feet
Streamflow	cubic metres per second	1 m^3/s = 35.3 cfs
Volume	cubic metres	1 X 10^6 m^3 = 811 acre-feet

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WATER SUPPLY REVIEW

1984

The 1984 irrigation season was one of very low water supply in the Oldman River Basin and Milk River Basin, and moderately low supply throughout the rest of the South and North Saskatchewan River Basins. This outcome resulted from below average snowfall in the Basin headwaters during the winter of 1983-84, and below average spring and summer rainfall throughout southern Alberta. The main effect of the low water supply was to limit the amount of water available for irrigation. Soil moisture conditions throughout southern Alberta improved greatly during September and October as the result of much above average autumn precipitation and the early onset of winter conditions.

WEATHER CONDITIONS IN SOUTHERN ALBERTA DURING 1984

The winter of 1983-84 in southern Alberta was characterized by below average snowfall and above average temperatures. Precipitation for the period November 1, 1983 to April 30, 1984 ranged between about 60 to 80 percent of average as illustrated in Figure 1. Spring snowmelt runoff from the plains areas was extremely light as a result.

The summer of 1984 in southern Alberta was characterized by a cold moderately dry spring, a hot dry summer, and a cold wet autumn. Precipitation for the period May 1 to October 31, 1984 was close to average except in the far south as illustrated in Figure 2. This was only because of the very wet autumn, however.

May was a cold month. The effect of the cold was to delay snowmelt runoff from the foothills and mountains, resulting in some early water supply problems for irrigation diversions. The flow of the Bow River below the Bassano Dam was reduced to the minimum allowable rate for much of May as the result of the delayed snowmelt runoff and above average rates of diversion to the Western, Bow River, and Eastern Irrigation Districts. Very low streamflow in the South Saskatchewan River downstream of the Bow River confluence also resulted from this situation.

Temperature conditions returned to normal by June. Snowmelt runoff from the foothills and mountains brought temporary relief to irrigation water supplies. Rainfall for May and June was still below average in the Oldman River Basin but close to average for most of the rest of southern Alberta as shown in Figure 3.

July was very hot and very dry throughout southern Alberta. August was also a dry month although not as dry as July. Water supply problems for irrigation diversions began to re-surface in late July, and lasted throughout the rest of the summer and into autumn. The dryness of mid-summer was compounded by the heat which increased the demand for water for irrigation. Rainfall for the July-August period is shown in Figure 4.

After the hot dry summer, autumn in the south was generally cold and very wet. Snow fell in many areas in September. The above average

precipitation did little to help irrigation operations for 1984 or significantly improve streamflow conditions, but it did improve soil moisture conditions throughout southern Alberta considerably and will be of benefit during the 1985 season. Precipitation for the September-October period is shown in Figure 5.

A key map of climate stations and the hydrography of southern Alberta is presented for reference as Figure 6. Precipitation accumulation patterns for several key stations in southeastern Alberta for the May-October 1984 period are presented as Figure 7. The lack of precipitation in the Medicine Hat area for the months of July and August is of special note.

STREAMFLOW CONDITIONS IN SOUTHERN ALBERTA DURING 1984

As a result of the generally dry weather, streamflow was below average throughout southern Alberta for most of the summer of 1984. The hydrograph for the South Saskatchewan River downstream of the Red Deer River confluence (ie. at the Alberta-Saskatchewan border) is presented as Figure 8. Hydrographs for a number of key river locations are presented in the river basin sections which follow. Streamflow conditions are dealt with in more detail in these individual basin sections.

WATER SUPPLY VOLUMES IN SOUTHERN ALBERTA IN 1984

Following is a comparison of the early May 1984 forecast of water supply volumes and the actual volumes for the season:

STATION	PERIOD	MAY 1984 FORECAST % OF AVERAGE	ACTUAL VOLUME % OF AVERAGE
Oldman River near Lethbridge	Apr - Sept	55	49
Bow River at Calgary	May - Sept	86	67
Red Deer at Red Deer	Apr - Sept	75	42
North Saskatchewan River at Edmonton.	Apr - Sept	89	67

The actual volumes are considerably lower than the May forecast as the result of below average rainfall during the spring and summer. The water supply forecasts assume that future precipitation will be about average since it is presently not possible to obtain any reliable long-range precipitation forecasts.

More detailed descriptions of the actual water supply volume conditions for 1984 are presented in the river basin descriptions which follow and in Table 1.

WATER STORAGE CONDITIONS IN SOUTHERN ALBERTA IN 1984

The water storage situation for the irrigation and hydroelectric reservoirs in southern Alberta was generally good in the spring of 1984. Active storage of water from mountain snowmelt runoff was delayed somewhat by the cool weather in May. Heavy demand for water for irrigation during the summer resulted in many of the irrigation reservoirs being drawn down to very low levels. By the end of the season, most reservoirs had been refilled to satisfactory levels with the exception of the Waterton and St. Mary Reservoirs which were considerably below average levels as of November 1, 1984.

A detailed presentation of the storage situation as of November 1, 1984 is given in Table 2. Graphs of the storage for various reservoir systems throughout the 1984 runoff season are presented in the individual river basin sections which follow.

WEATHER AND STREAMFLOW CONDITIONS IN NORTHERN ALBERTA IN 1984

Snowfall for northern Alberta during the winter of 1983-84 was generally below average. Spring snowmelt occurred earlier than usual with very light runoff in most areas.

Late spring and early summer rainfall was generally above average resulting in streamflow conditions which were close to normal for most of the summer. There were a few incidents of minor flooding from rainfall runoff.

Rainfall during July and August was relatively light but streamflow levels remained close to normal for most streams. The autumn was wet and cold with some snowfalls in September. By early October, most of the north had snowcover which did not disappear. River freeze-up occurred earlier than usual.

SNOW SURVEYS IN 1984

Surveys of the depth and water content of the snowpack in the plains and mountainous areas of Alberta were conducted by the Survey Branch of Alberta Environment between February and June in 1984. The results of these surveys are presented in Appendix A of this report. An index of the snow survey sites is presented in Appendix B.

Precipitation data from a number of selected sites in the Alberta Forest Service network of Sacramento Storage Gauges are also reported in Appendix A. A map showing the location of these sites is given in Appendix B.

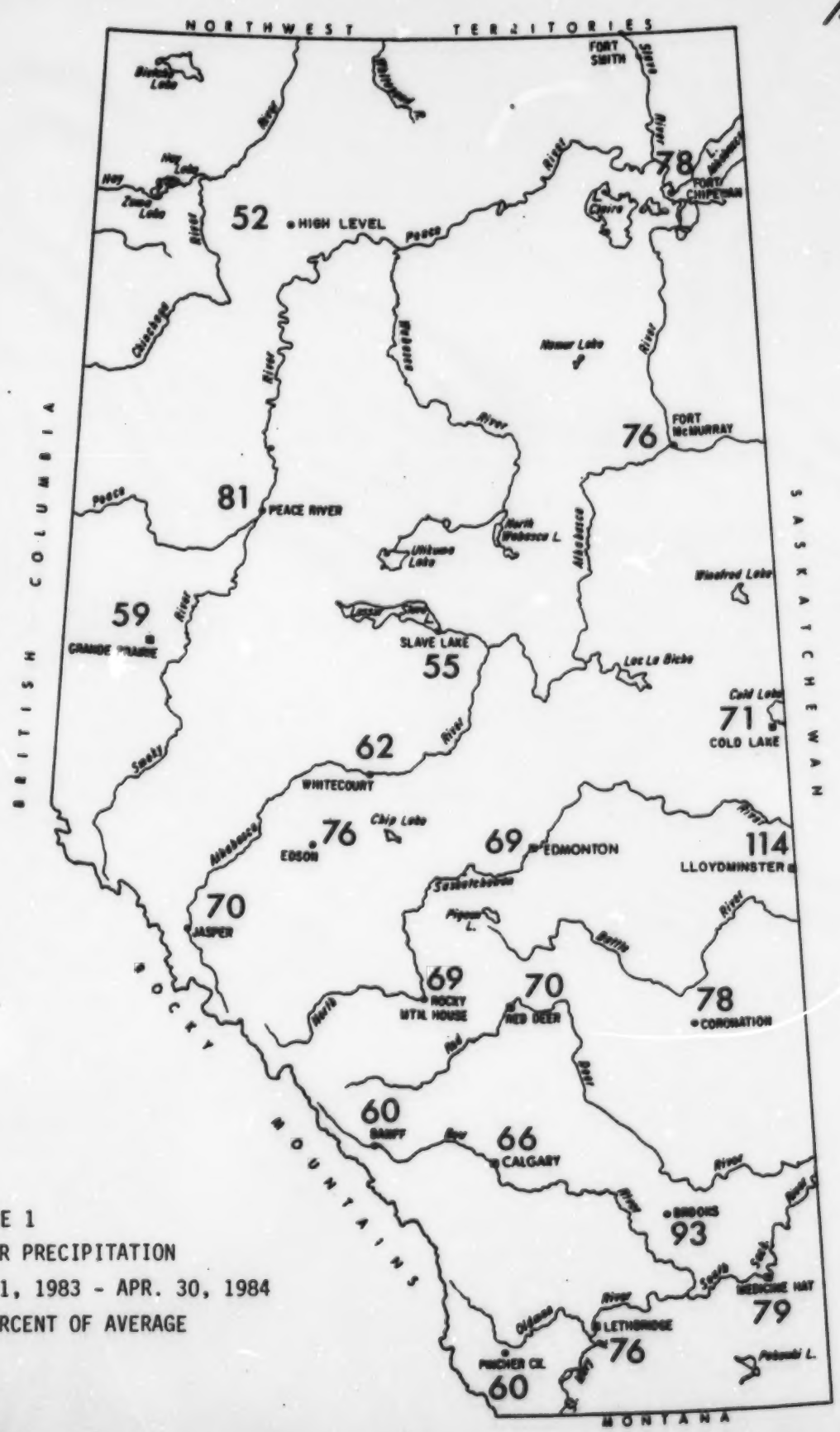

FIGURE 1
WINTER PRECIPITATION
NOV. 1, 1983 - APR. 30, 1984
AS PERCENT OF AVERAGE

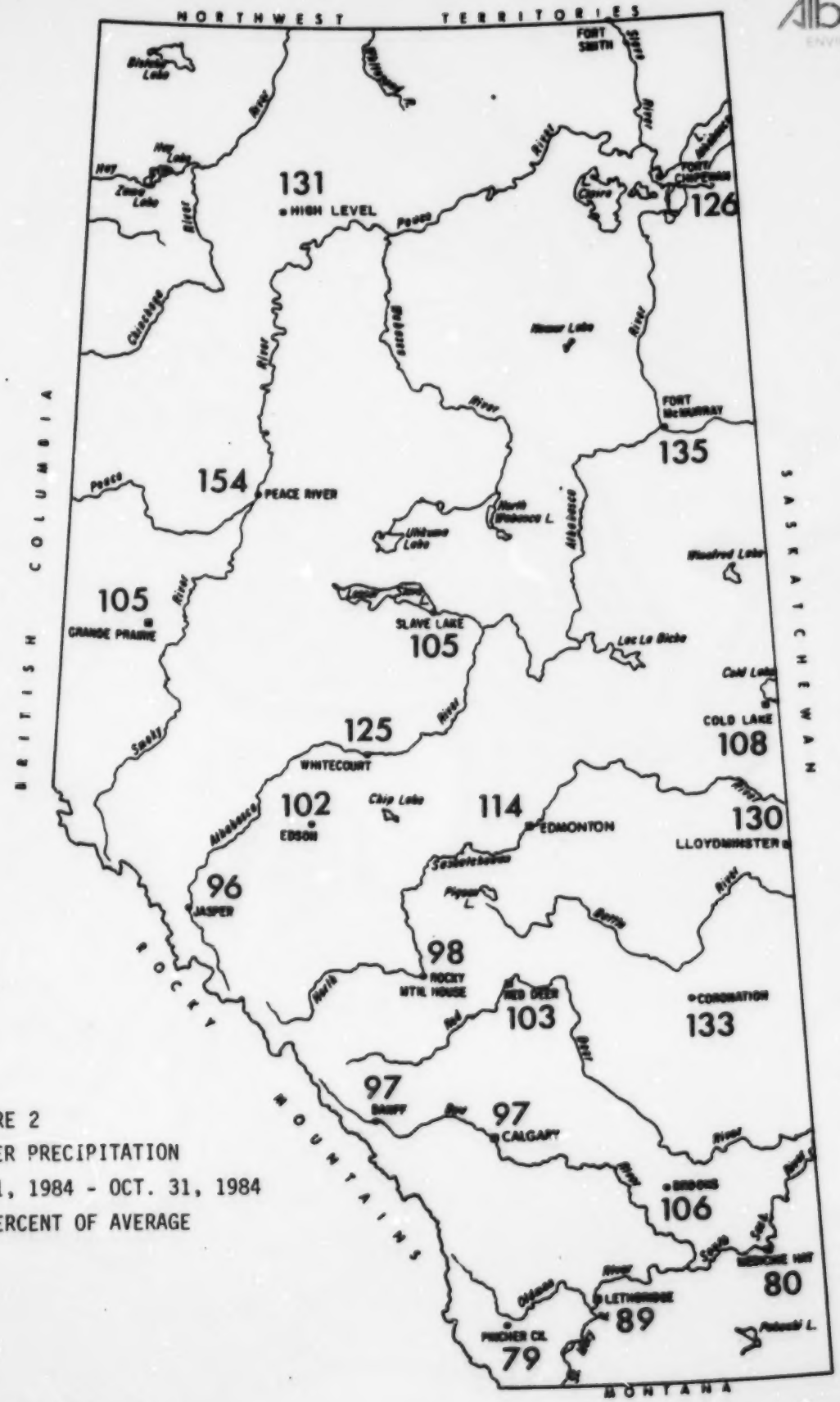

FIGURE 2
SUMMER PRECIPITATION
MAY 1, 1984 - OCT. 31, 1984
AS PERCENT OF AVERAGE

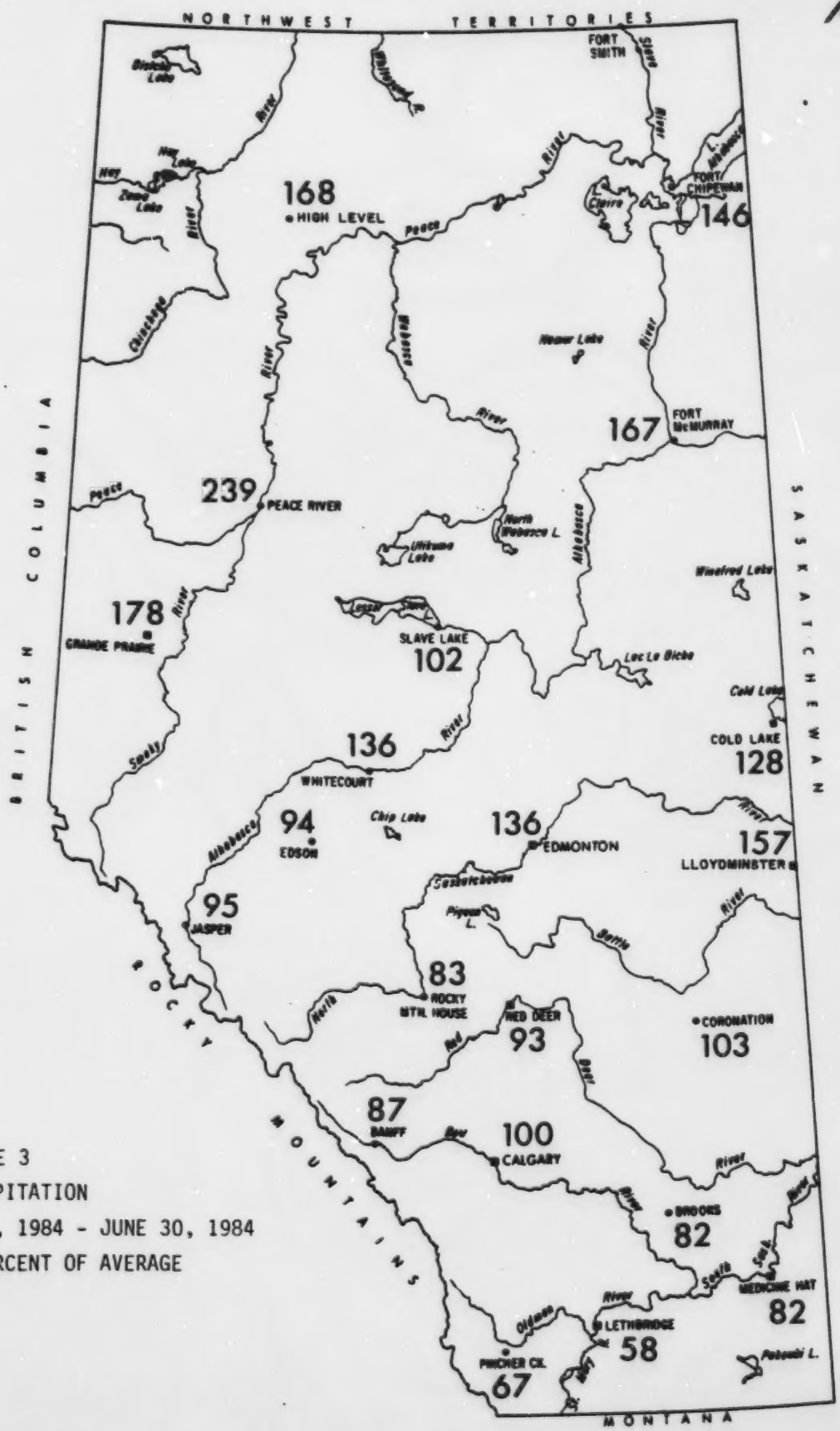

FIGURE 3
PRECIPITATION
MAY 1, 1984 - JUNE 30, 1984
AS PERCENT OF AVERAGE

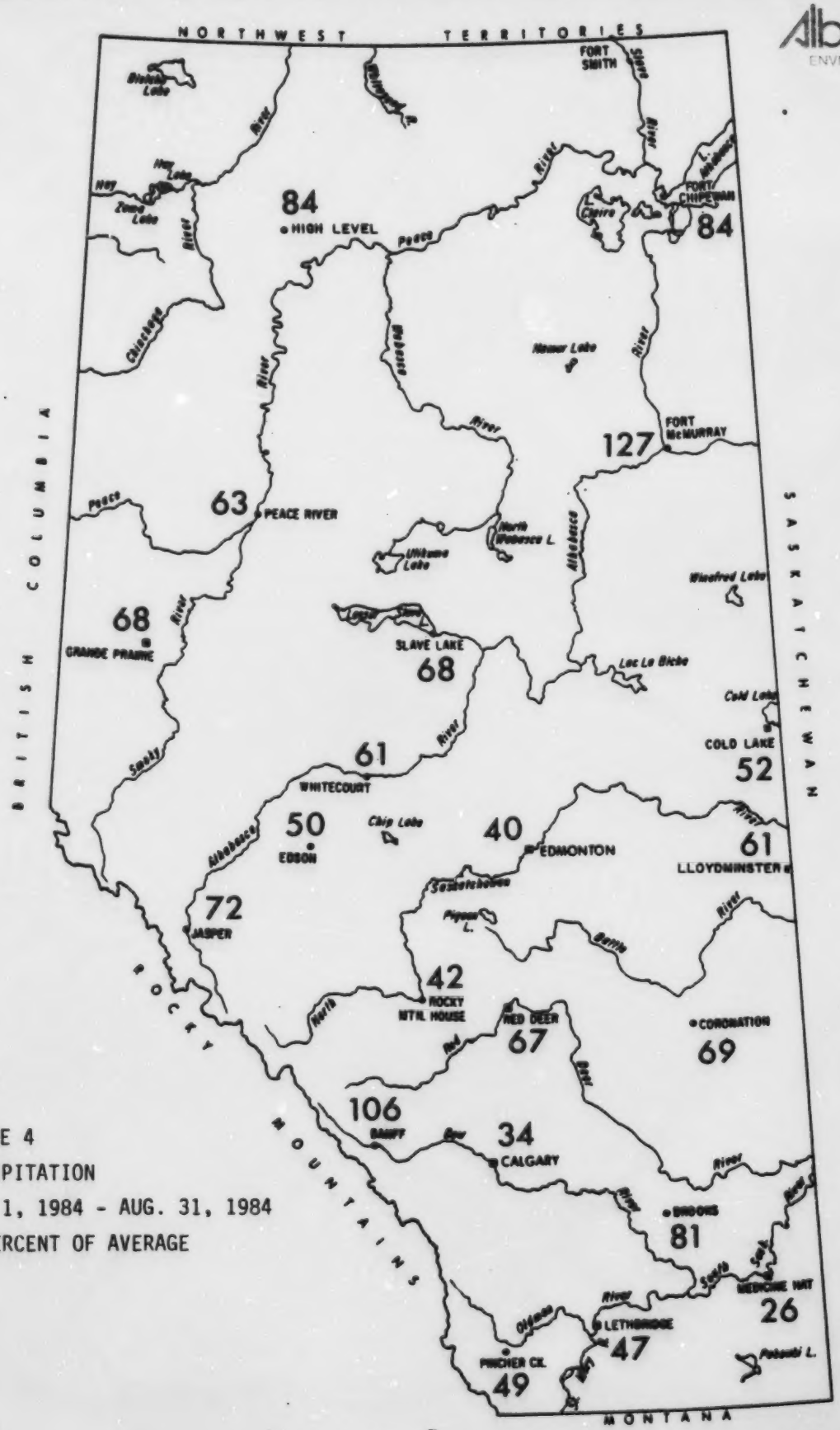

FIGURE 4
PRECIPITATION
JULY 1, 1984 - AUG. 31, 1984
AS PERCENT OF AVERAGE

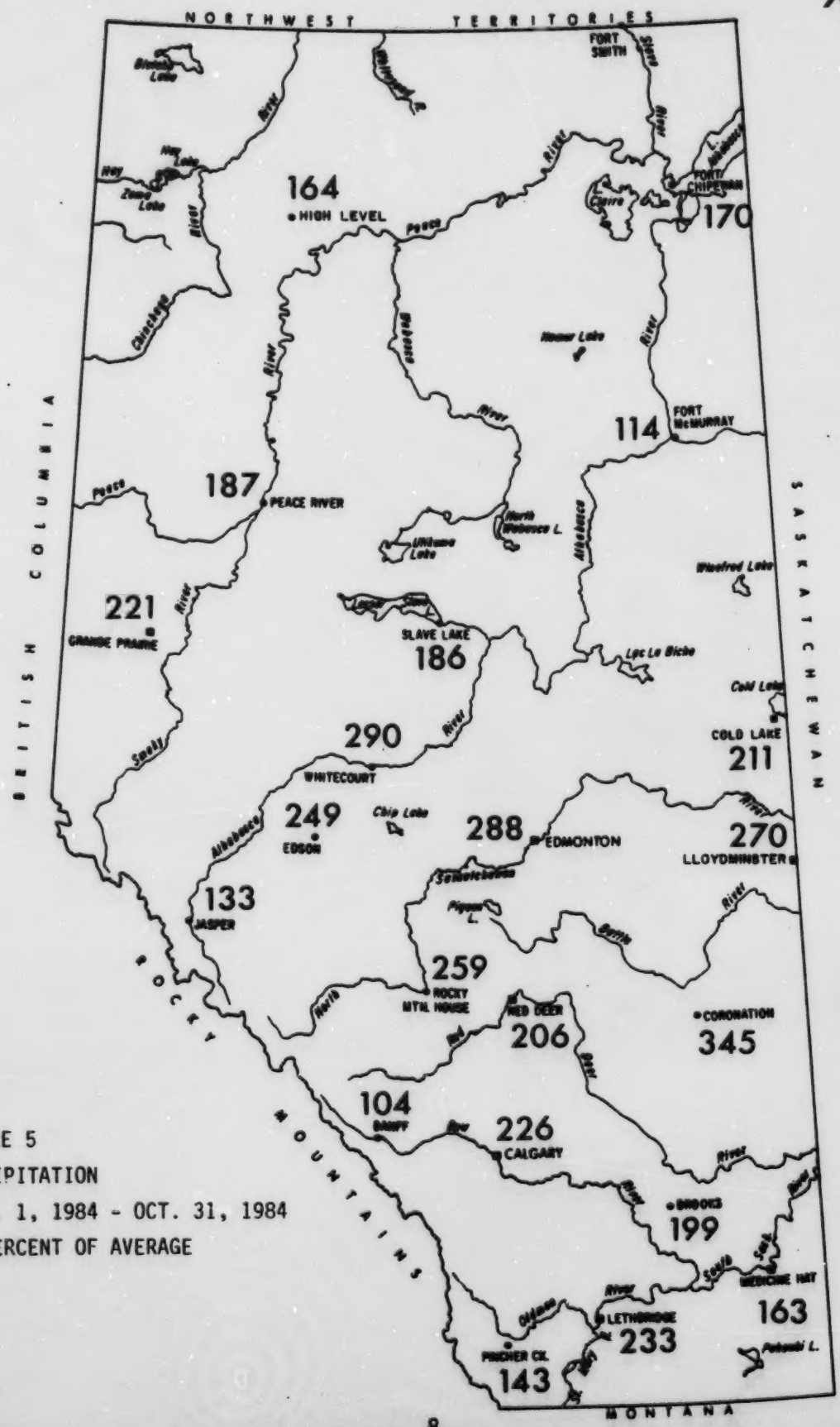

FIGURE 5
PRECIPITATION
SEPT. 1, 1984 - OCT. 31, 1984
AS PERCENT OF AVERAGE

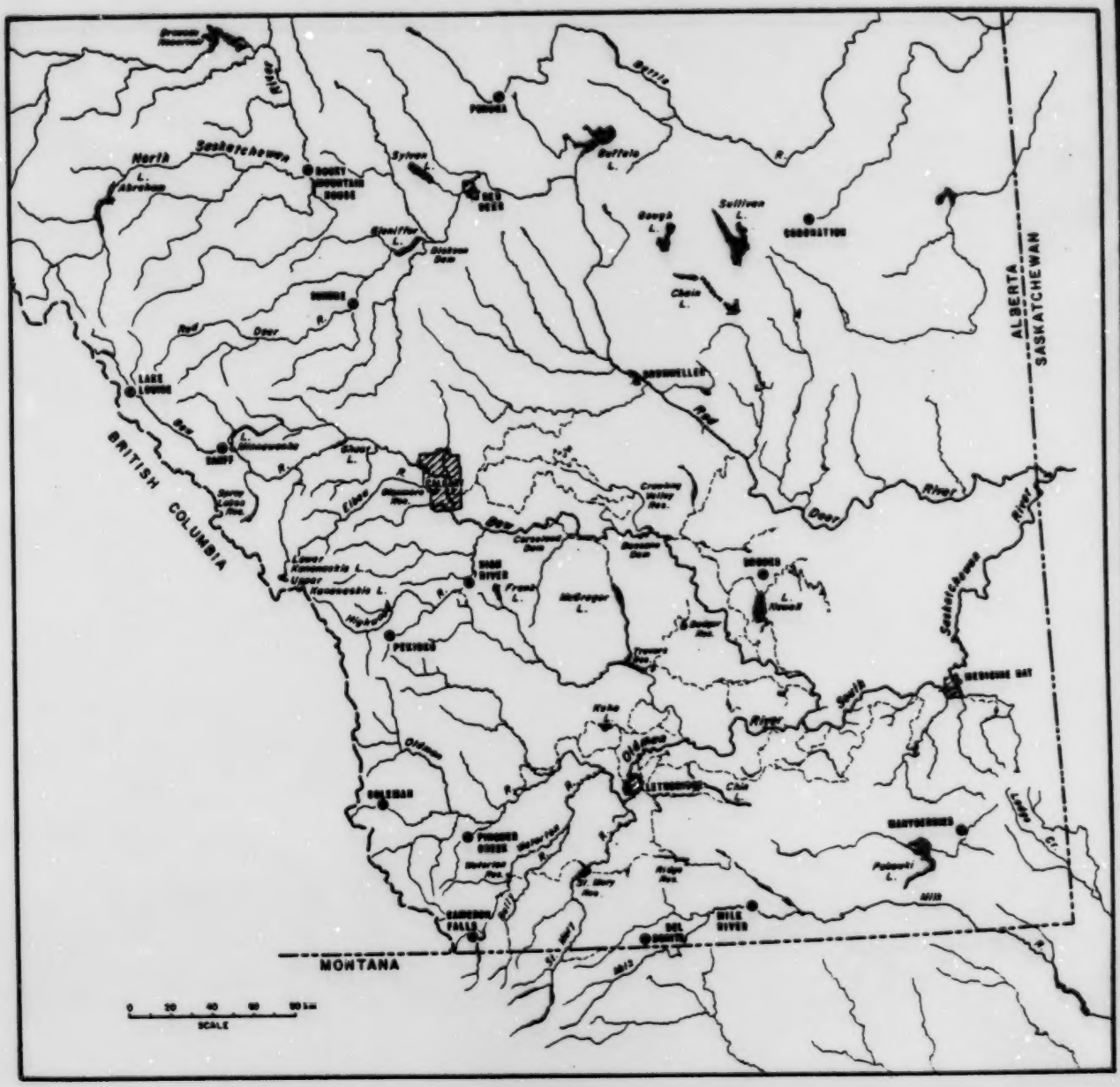

FIGURE 6
KEY MAP FOR
CLIMATE STATIONS AND HYDROGRAPHY
IN SOUTHERN ALBERTA

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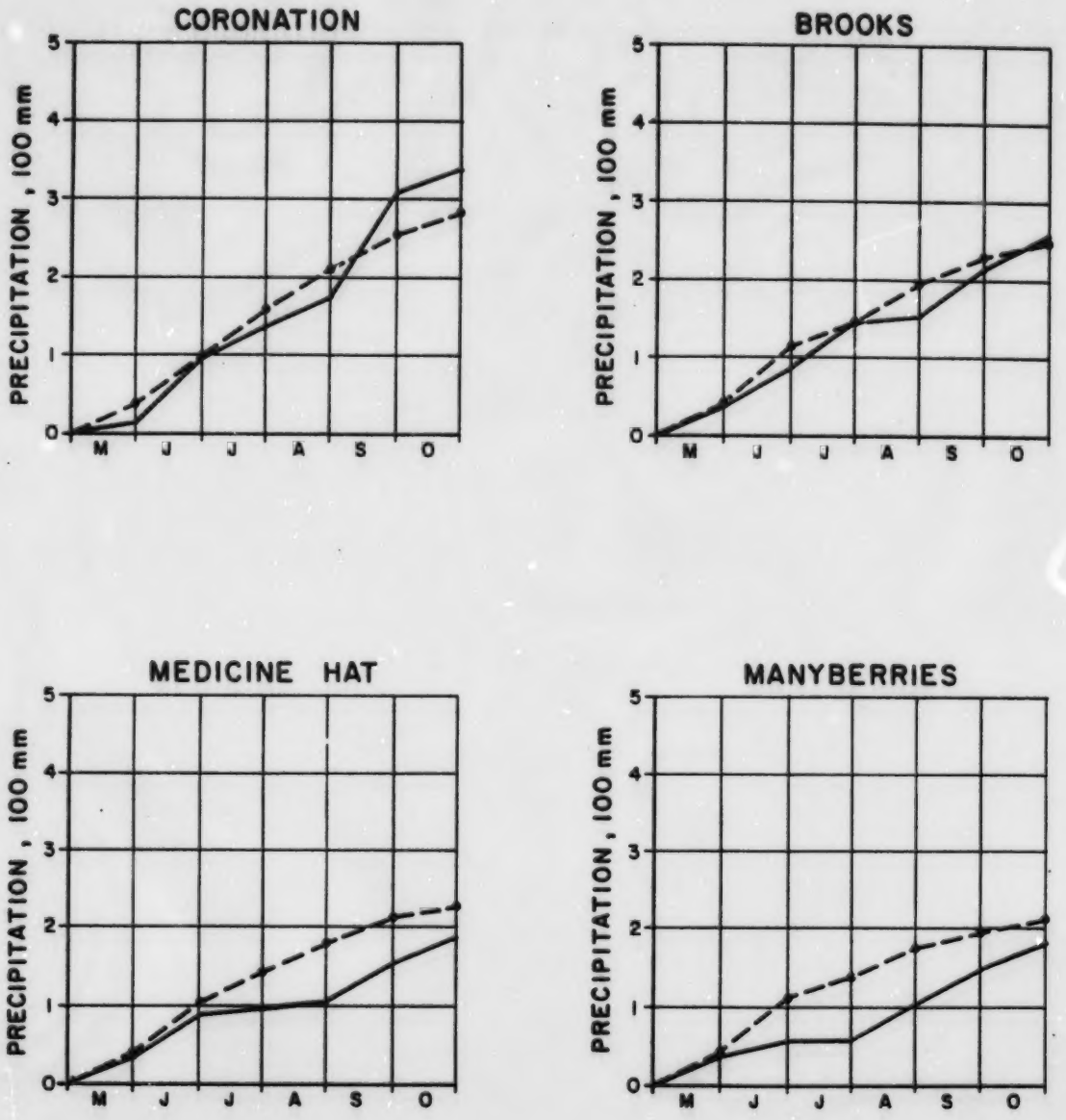

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN	
		SUMMER PRECIPITATION SOUTHEASTERN ALBERTA	
SUBMITTED DATE	DESIGNED CHECKED		
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE DEC. , 1984	FIGURE 7

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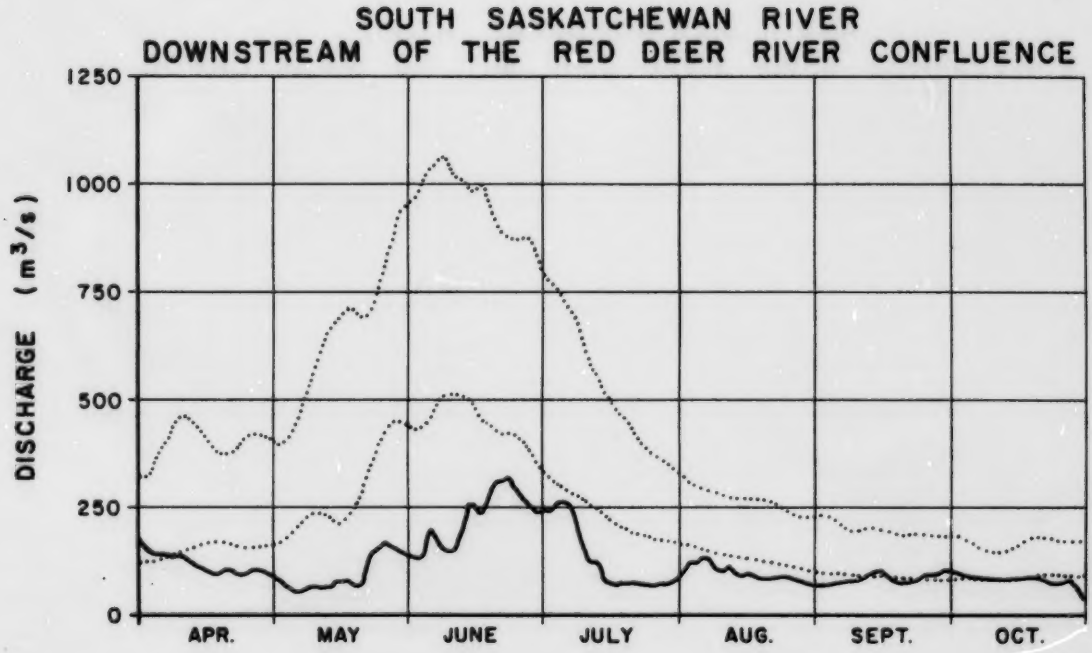

NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of the range of normal behaviour.

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
		STREAMFLOW HYDROGRAPH SOUTH SASKATCHEWAN RIVER
SUBMITTED DATE	DESIGNED CHECKED	
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE JAN., 1988 FIGURE 8

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WATER SUPPLY REVIEW

TABLE 1

ACTUAL WATER SUPPLY VOLUMES FOR 1984
(Natural Flow)

	Volume ($10^6 m^3$)	(% of Avg.)
OLDMAN RIVER BASIN (April to September)		
St. Mary River/International Boundary	500	72
Belly River near Mountain View	180	67
Waterton River at Waterton Park	340	65
Oldman River near Fort McLeod	530	43
Oldman River near Lethbridge	1590	49
BOW RIVER BASIN (May to September)		
Bow River at Banff	820	78
Bow River at Calgary	1600	67
Elbow River	100	49
Highwood River	220	35
RED DEER RIVER BASIN (April to September)		
Red Deer River at Red Deer	530	42
NORTH SASKATCHEWAN RIVER BASIN (April to September)		
North Saskatchewan River at Edmonton	3950	67

NOTE: Water supply volumes reported above are the natural runoff which occurred; adjustments have been made to recorded flow volumes to account for the affects of diversion and reservoir storage.

$1 \times 10^6 m^3$ = 811 ac-ft = 410 cfs days

Alberta ENVIRONMENT

WATER SUPPLY REVIEW

TABLE 2

MAJOR WATER STORAGE RESERVOIRS IN ALBERTA

Status as of November 1, 1984

	LIVE STORAGE ($10^6 m^3$)	PERCENT OF MAXIMUM LIVE STORAGE	REMARKS	LIVE STORAGE ($10^6 m^3$) 1983
OLDMAN RIVER BASIN				
St. Mary Reservoir	135	37	Below Normal	187
Waterton Reservoir	11	10	Below Normal	55
Ridge Reservoir	97	76	Normal	83
Chin Reservoir	176	90	Normal	110
TOTAL	419			435
BOW RIVER BASIN				
Lake Minnewanka	112	50	Below Normal	186
Lower Kananaskis Lake	57	90	Normal	59
Upper Kananaskis Lake	102	82	Normal	91
Spray Lake	244	91	Normal	220
TOTAL	515			556
Lake McGregor	318	97	Normal	308
Travers Reservoir	73	62	Normal	84
TOTAL	391			392
Lake Newell	146	82	Normal	130
RED DEER RIVER BASIN				
Gleniffer Lake (Dickson Reservoir)	206	99	Normal	191
NORTH SASKATCHEWAN RIVER BASIN				
Lake Abraham	1160	82	Normal	1130
Brazeau Reservoir	444	91	Normal	459
TOTAL	1604			1589

NOTE: 1 x $10^6 m^3$ = 811 ac-ft = 409 cfs days

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MILK RIVER BASIN

WEATHER CONDITIONS DURING 1984

Snowfall during the winter of 1983-84 was very light in the Milk River Basin. Precipitation accumulation for the period November 1, 1983 to April 30, 1984 was only about 70 percent of average. The winter was relatively warm as well. Spring snowmelt runoff was very light as a result.

The spring and summer of 1984 continued dry. Rainfall from May to August was only about 60 percent of the average.

September was wet and cold. October precipitation was slightly below average, and temperatures remained below normal. The cold, wet autumn resulted in some improvement to soil moisture conditions for the spring of 1985.

A graphs of precipitation accumulation at Del Bonita for the May-October period compared to historical average values is presented in Figure 9.

STREAMFLOW CONDITIONS IN 1984

As a result of the low winter snowpack and the dry summer, natural streamflow conditions for the Milk River were much below average for the entire season. Much of the flow in the river during the summer came from the U. S. diversion to the Milk River from the St. Mary River as is normally the case. The hydrograph for the Milk River at Milk River for the April-October period is presented in Figure 10.

WATER SUPPLY CONDITIONS IN 1984

Because of the U. S. diversion to the Milk River from the St. Mary River, the water supply for irrigation from the river was adequate for most of the summer. The U. S. diversion was shut down earlier than usual as the result of low water supply in the St. Mary River Basin.

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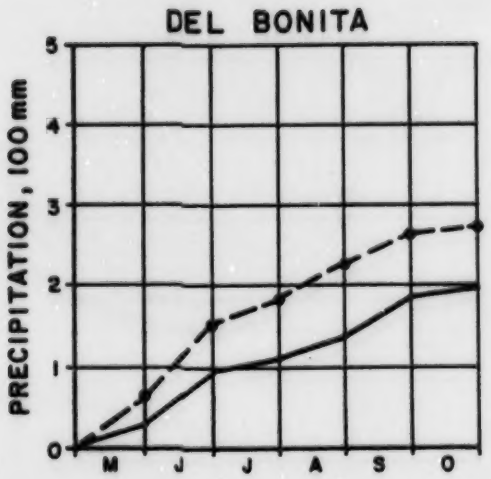
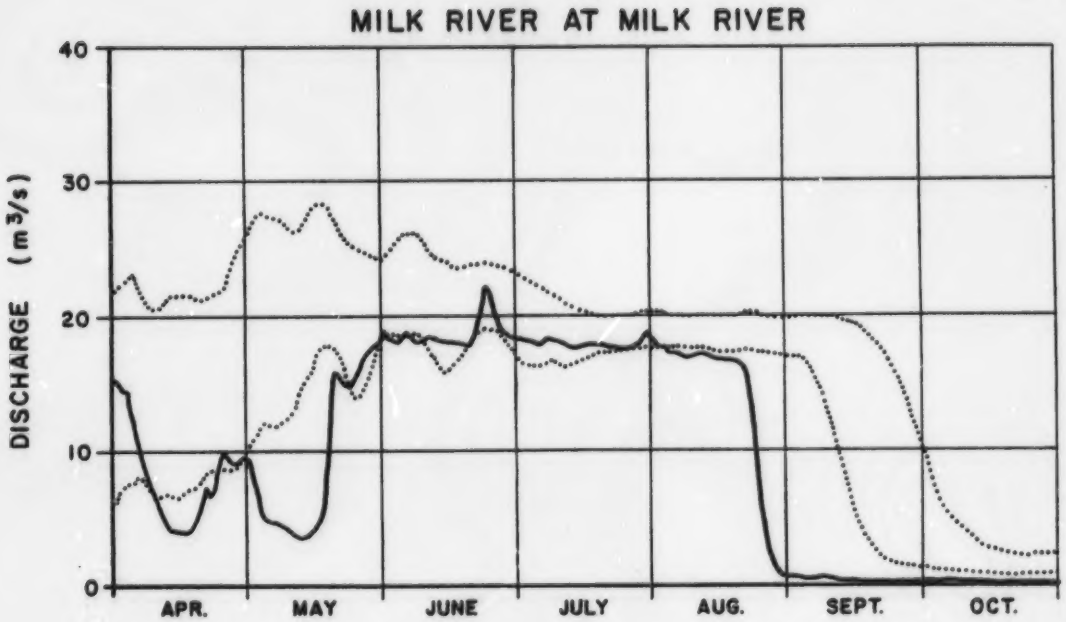


LEGEND

--- AVERAGE

——— 1984

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
		SUMMER PRECIPITATION MILK RIVER BASIN
SUBMITTED DATE	DESIGNED	
	CHECKED	
APPROVED DATE	DRAWN L. Markley	SCALE AS SHOWN
	CHECKED	DATE DEC., 1984
		FIGURE 9



NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of the range of normal behaviour.

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN	
		STREAMFLOW HYDROGRAPH MILK RIVER	
SUBMITTED DATE	DESIGNED CHECKED		
APPROVED DATE	DRAWN L. Markey CHECKED	SCALE AS SHOWN DATE JAN., 1985	FIGURE 10

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OLDMAN RIVER BASIN

WEATHER CONDITIONS DURING 1984

The winter of 1983-84 was one of very low snowfall in the headwaters of the Oldman River Basin. Precipitation accumulation for the period November 1, 1983 to April 30, 1984 was generally only 60 to 70 percent of average. In the plains area of the Basin, the winter was also dry and warm, and spring snowmelt runoff was extremely light.

The spring of 1984 continued dry but turned cold from late April into mid-May. The cold weather delayed snowmelt runoff from the foothills and mountains, resulting in very low streamflow during this period.

Summer was an extremely dry period throughout most of the Basin. Rainfall during July and August was only about half of the average. There was a period of about 4 consecutive weeks in July and August when practically no rain fell.

The precipitation pattern changed in September from dry to wet. Precipitation amounts for September and October were generally about twice the average amount. Freezing weather came earlier than normal. Several significant snowfalls occurred in September and October. The cold, wet autumn resulted in improved soil moisture conditions throughout the Basin for the spring of 1985.

Graphs of precipitation accumulation for the May-October period for several index stations in the Basin compared to historical average values are presented in Figure 11 following.

STREAMFLOW CONDITIONS IN 1984

As a result of the low winter snowpack, the cold spring, and the dry summer, streamflow conditions throughout the Oldman River Basin were consistently below average for the entire season. Hydrographs for a number of key locations within the Basin for the April-October period are presented in Figures 12 to 15 following.

WATER SUPPLY CONDITIONS IN 1984

The water supply situation for the summer of 1984 turned out to be more or less as expected in the spring. A comparison of the early May forecast and the actual April-September streamflow volumes is presented following.

STATION	MAY 1984 FORECAST % OF AVERAGE	ACTUAL VOLUME % OF AVERAGE
St. Mary River at International Boundary	70	72
Belly River near Mountainview	70	67
Waterton River at Waterton Park	70	65
Oldman River near Ft. Macleod	50	43
Oldman River near Lethbridge	55	49

The low water supply situation adversely affected irrigation operations in many areas but principally in the Lethbridge Northern Irrigation District and along Willow Creek. The low flow in the Oldman River limited the rate of diversion to the LNID by the latter part of July. Natural water supply to the St. Mary and Waterton Reservoir was below average but this did not limit the rate of supply to the St. Mary River Irrigation District. In fact, the rate of supply to the SMRID was well above average as indicated in the hydrograph for the St. Mary Canal at Drop No. 1 which follows.

WATER STORAGE CONDITIONS IN 1984

Graphs of the water storage situation for the major storage systems in the Basin during 1984 are presented in Figure 16 following.

The graphs are indicative of the heavy demand for water for irrigation during 1984. Storage at the end of the season was below average for the Waterton-St. Mary-Ridge system. The capacity of the diversion canal and the low flow of the Oldman River combined to give the LNID storage problems in Keho Lake for most of the summer.

A more detailed account of the storage status as of November 1, 1984 is presented in Table 2.

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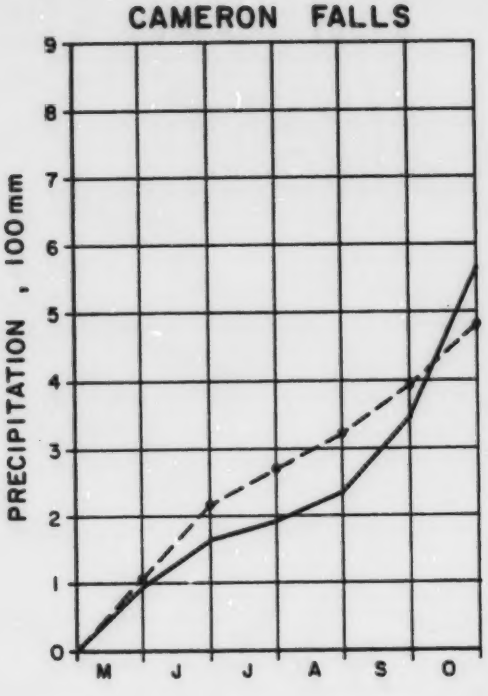

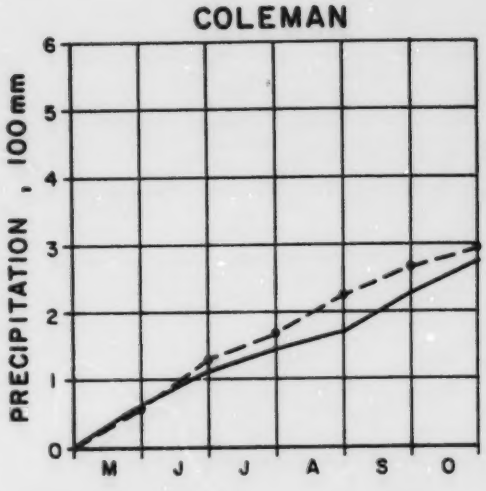

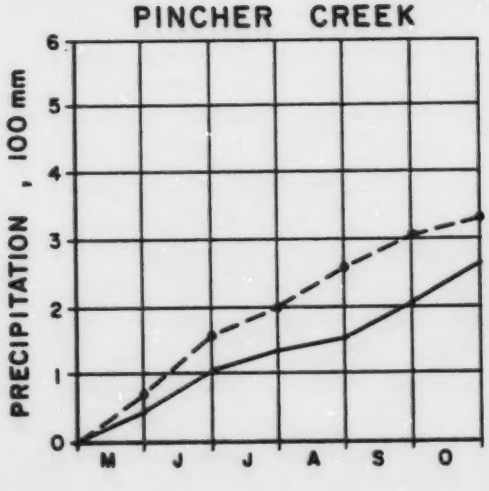

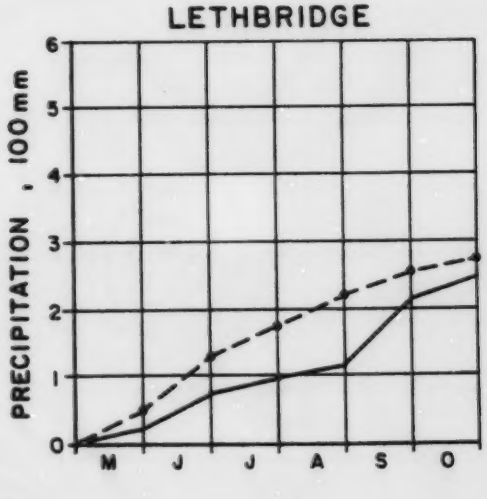

LEGEND

---- AVERAGE

——— 1984

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN	
		SUMMER PRECIPITATION OLDMAN RIVER BASIN	
SUBMITTED DATE	DESIGNED CHECKED		
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN	FIGURE 11
		DATE DEC. , 1984	

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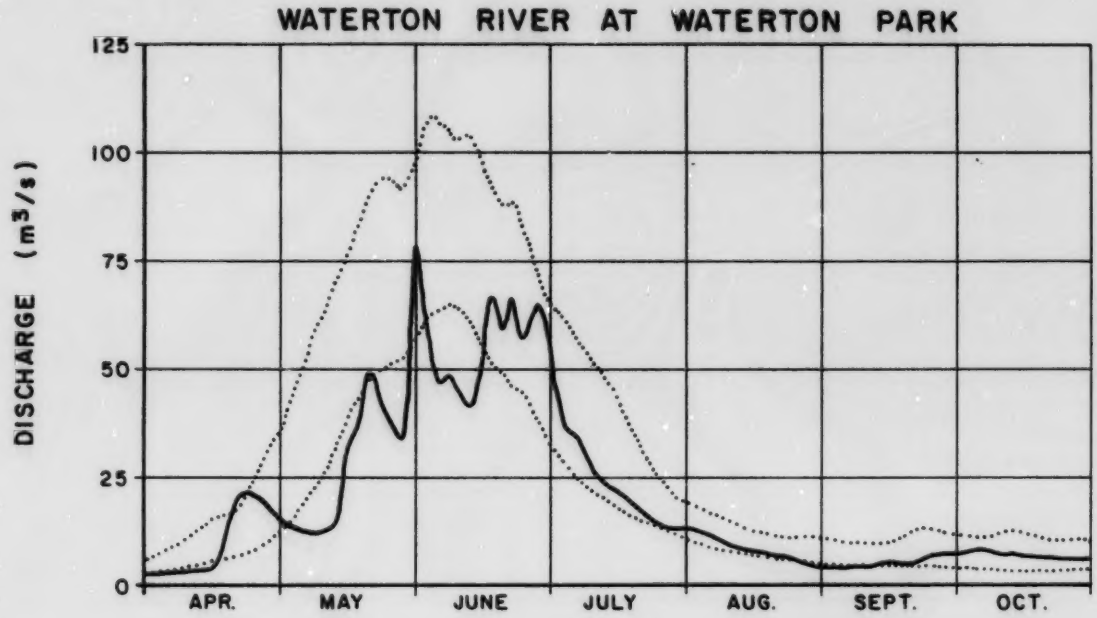

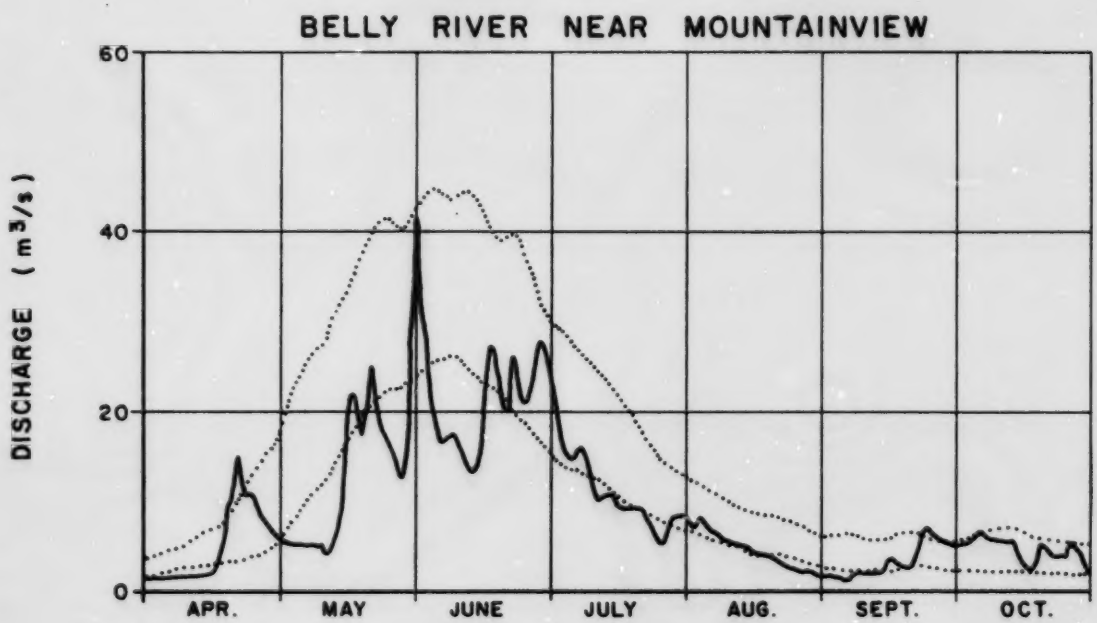

NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of the range of normal behaviour.

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
		STREAMFLOW HYDROGRAPHS OLDMAN RIVER BASIN
SUBMITTED DATE	DESIGNED CHECKED	
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE JAN. 1988
		FIGURE 12

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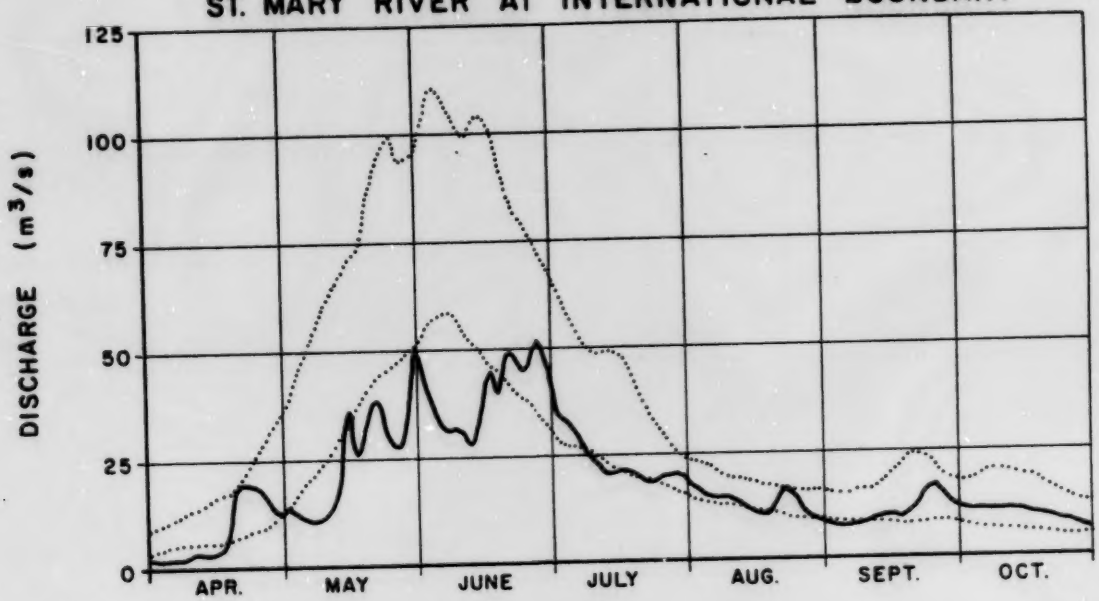
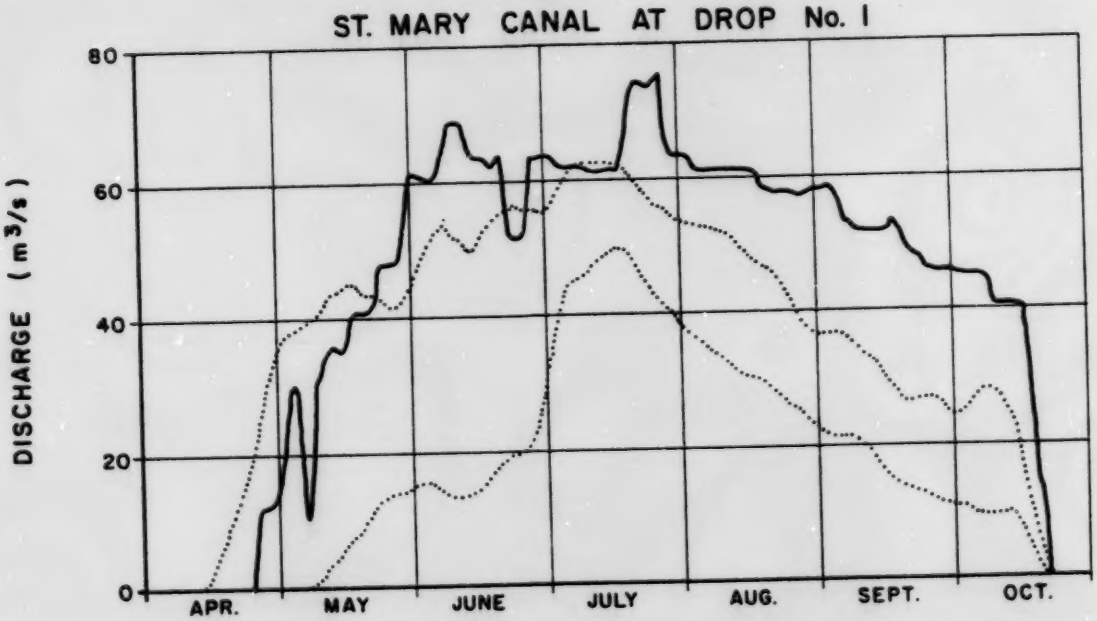
ENVIRONMENT

ST. MARY RIVER AT INTERNATIONAL BOUNDARY



ST. MARY CANAL AT DROP No. 1

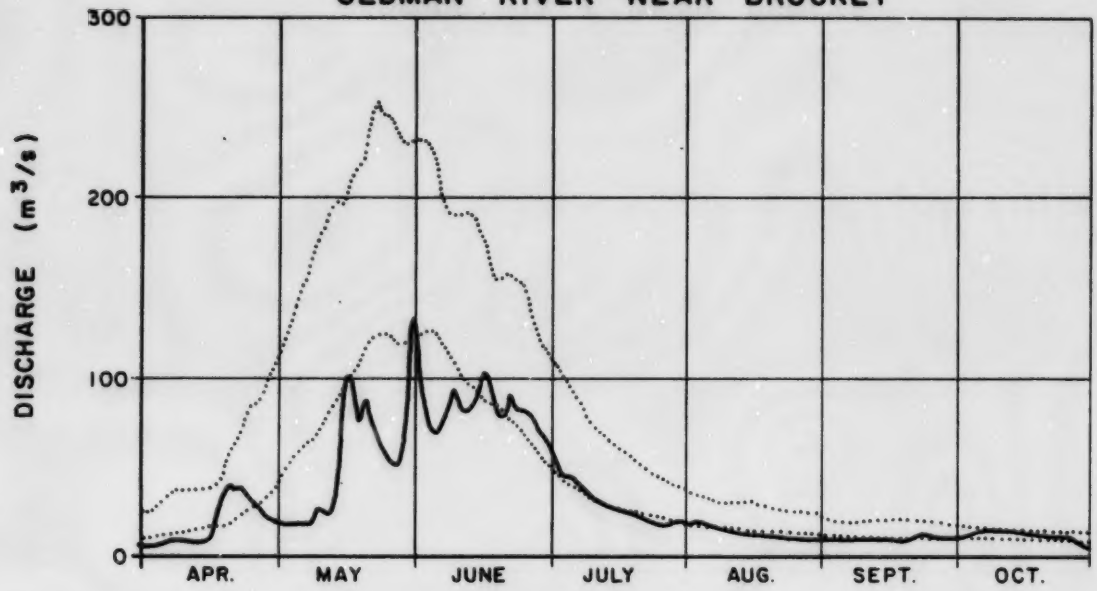


NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of the range of normal behaviour.

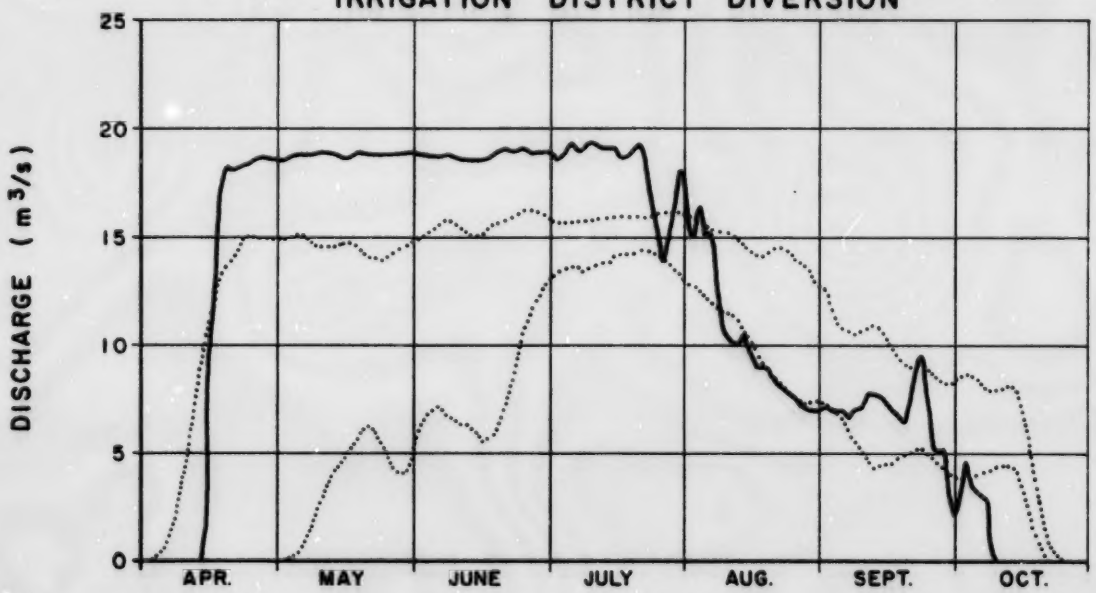
Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
		STREAMFLOW HYDROGRAPHS OLDMAN RIVER BASIN
SUBMITTED DATE	DESIGNED CHECKED	
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN FIGURE 13
		DATE JAN., 1988

Alberta ENVIRONMENT

OLDMAN RIVER NEAR BROCKET



LETHBRIDGE NORTHERN IRRIGATION DISTRICT DIVERSION

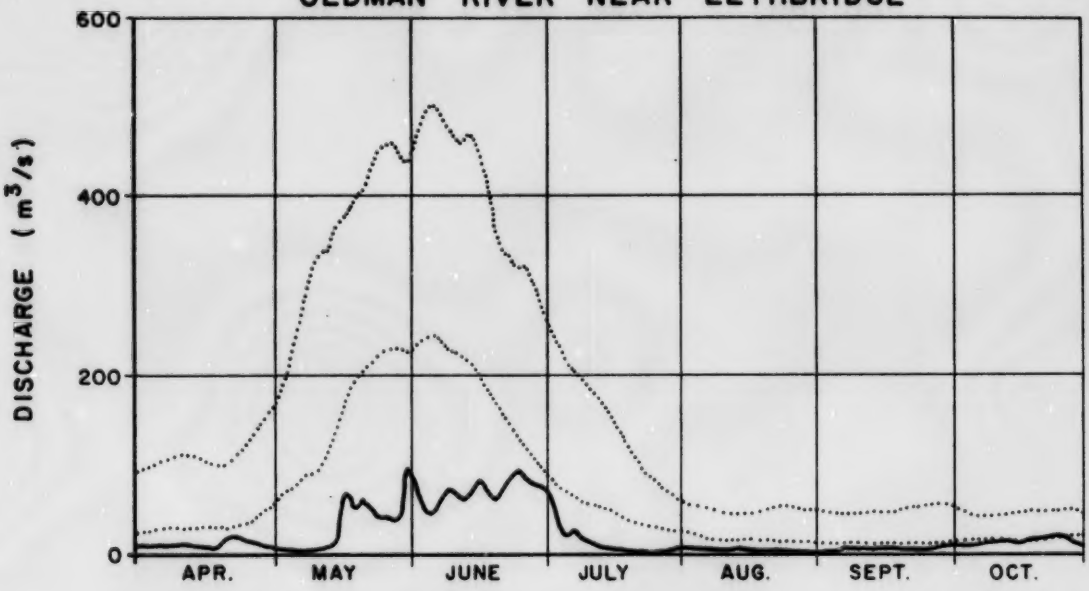


NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of the range of normal behaviour.

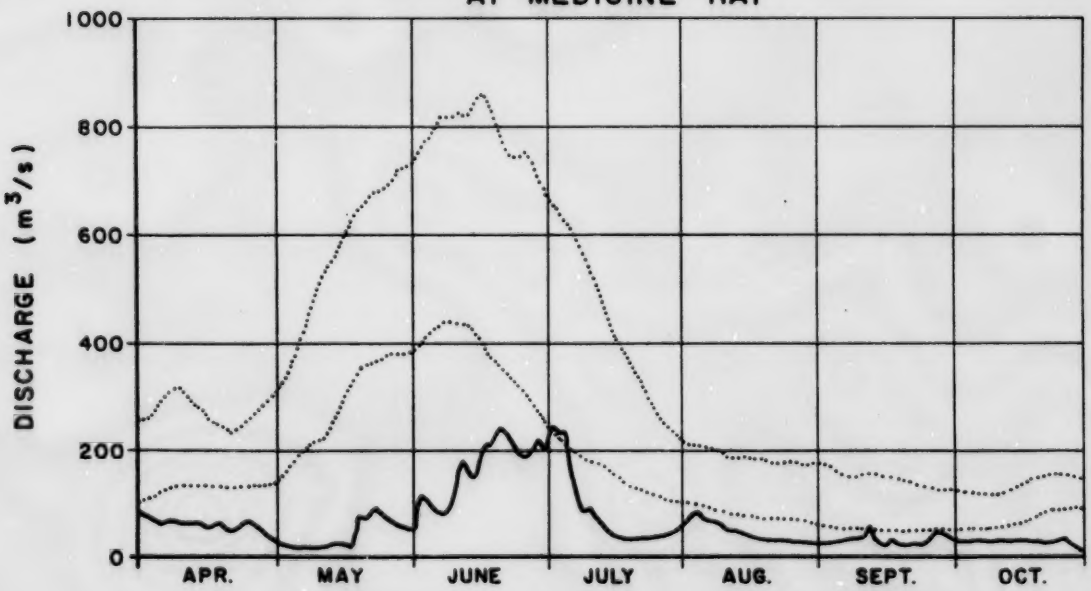
Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
SUBMITTED DATE	DESIGNED CHECKED	STREAMFLOW HYDROGRAPHS OLDMAN RIVER BASIN
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE JAN., 1988 FIGURE 14

Alberta
ENVIRONMENT

OLDMAN RIVER NEAR LETHBRIDGE



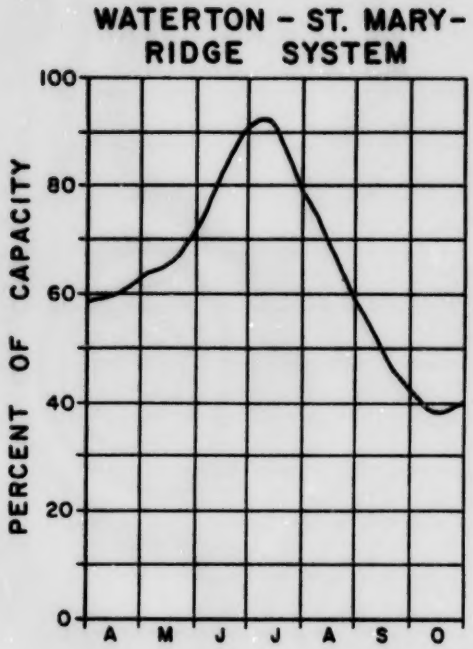
SOUTH SASKATCHEWAN RIVER AT MEDICINE HAT

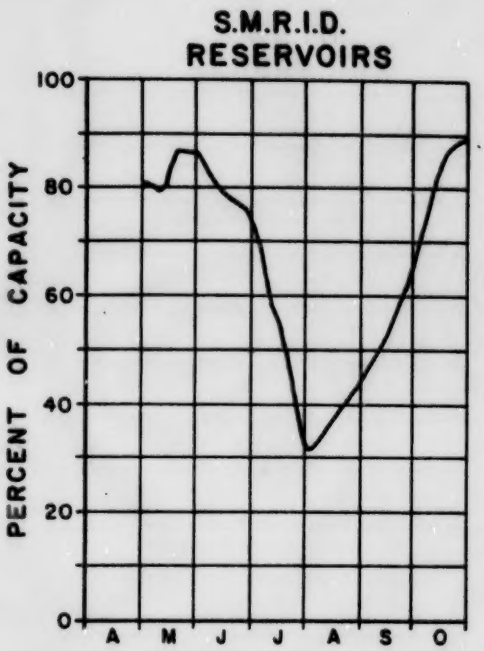


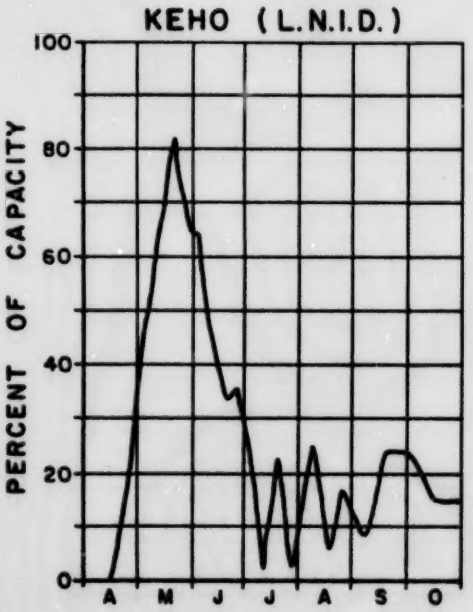
NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of the range of normal behaviour.

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
SUBMITTED DATE	DESIGNED CHECKED	STREAMFLOW HYDROGRAPHS OLDMAN RIVER BASIN
APPROVED DATE	DRAWN B. Sonderg CHECKED	SCALE AS SHOWN DATE JAN., 1988 FIGURE 15

Alberta
ENVIRONMENT







Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
		RESERVOIR STORAGE OLDMAN RIVER BASIN
SUBMITTED DATE	DESIGNED CHECKED	
APPROVED DATE	DRAWN B Sanders CHECKED	SCALE AS SHOWN DATE DEC., 1984 — FIGURE 16

BOW RIVER BASIN

WEATHER CONDITIONS IN 1984

Snowfall accumulation in the headwaters of the Bow River Basin ranged between 50 and 80 percent of average for the winter of 1983-84. Precipitation in the plains areas of the Basin was also below average for this period, and warm winter weather depleted much of the snowpack before springtime resulting in very light snowmelt runoff.

Spring precipitation amounts were closer to average although still generally somewhat below average. Cold weather predominated from mid-April to late May, resulting in a delay of the mountain snowmelt runoff season.

The summer months of July and August were generally hot and dry, particularly in the southern part of the Basin and in the plains areas. The northern headwaters were an exception to this situation with above average rainfall being recorded at both Banff and Lake Louise for the month of August.

September and October were relatively cold months with several snowfalls occurring during the period. Autumn precipitation was much above average in the foothills and plains areas but closer to average in the mountain headwaters. The wet autumn did much to improve the soil moisture conditions in the agricultural areas of the Basin for the spring of 1985.

Precipitation accumulation patterns for several index stations in the Basin for the May-October period are presented as Figure 17 following.

STREAMFLOW CONDITIONS IN 1984

The foothills rivers such as the Elbow and Highwood remained relatively low for the entire runoff season as a result of the low winter snowpack and dry summer. The Bow River and its mountain tributaries experienced more normal streamflow conditions during the summer although the cold spring delayed the melting of the mountain snowpack by several weeks.

Hydrographs for a number of key locations within the Basin for the April-October period are presented as Figures 18 to 21 following.

WATER SUPPLY CONDITIONS IN 1984

The actual natural water supply for the major rivers of the Basin was considerably less than what was expected in the spring of 1984. A comparison of the early May forecast and the actual volumes is given following.

STATION	MAY 1984 FORECAST % OF AVERAGE	ACTUAL VOLUME % OF AVERAGE
Bow River at Banff	87	78
Bow River at Calgary	86	67
Elbow River	80	49
Highwood River	71	35

The primary reason for actual volumes being so much less than expected was the dryness of the summer. The water supply forecasts assume that the precipitation for the months to come will most probably be close to average.

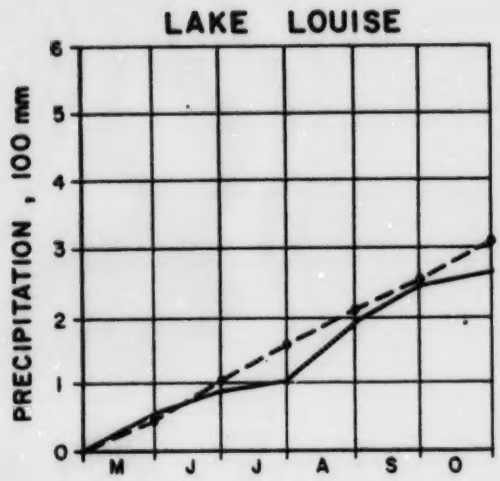
The irrigation operations of the Districts within the Bow River Basin were affected very little by the low water supply in the River. This was because of the relatively good streamflow conditions in the Bow River during the peak water use months of June and July and because of the water available from storage reservoirs.

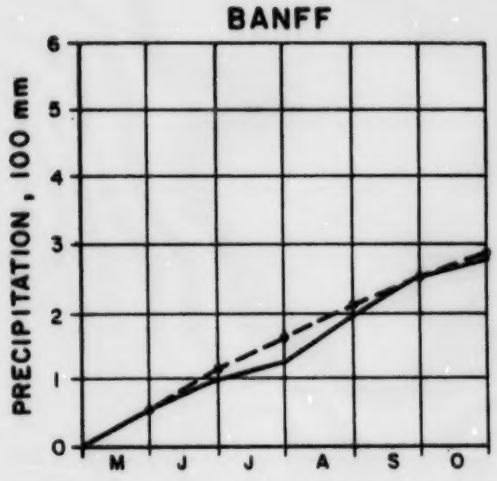
WATER STORAGE CONDITIONS IN 1984

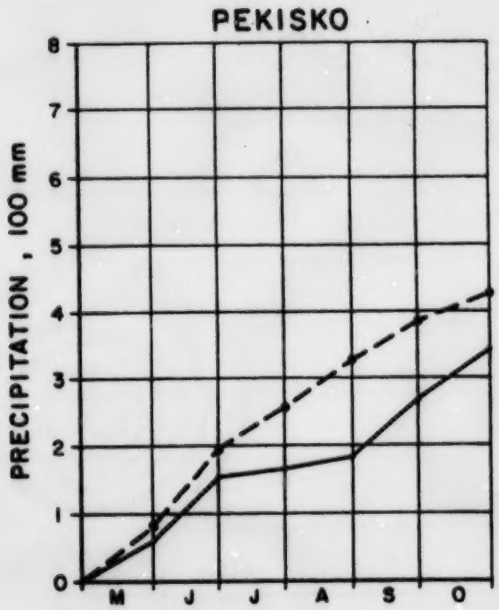
All the major irrigation and hydroelectric power reservoirs in the Basin were at near normal levels by the end of the season. Heavy irrigation demand for water resulted in some of the irrigation reservoirs being drawn down to very low levels by mid-summer. The Eastern Irrigation District had hoped to partially fill the new Crawling Valley Reservoir during the autumn but was unable to do so because of the low water supply at that time.

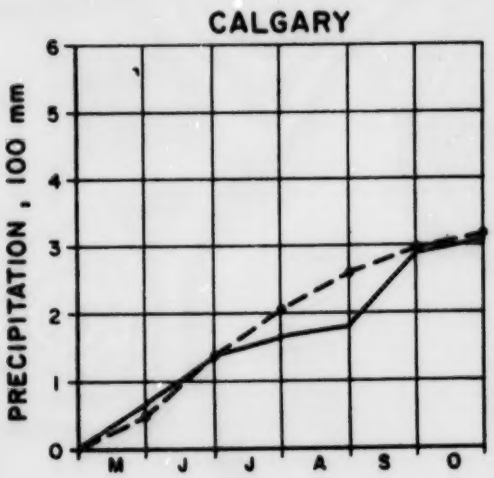
Graphs of the storage situation for the major reservoir systems in the Basin for the 1984 season are presented in Figure 22. A detailed account of the storage situation as of November 1, 1984 is presented in Table 2.

Alberta
ENVIRONMENT









LEGEND

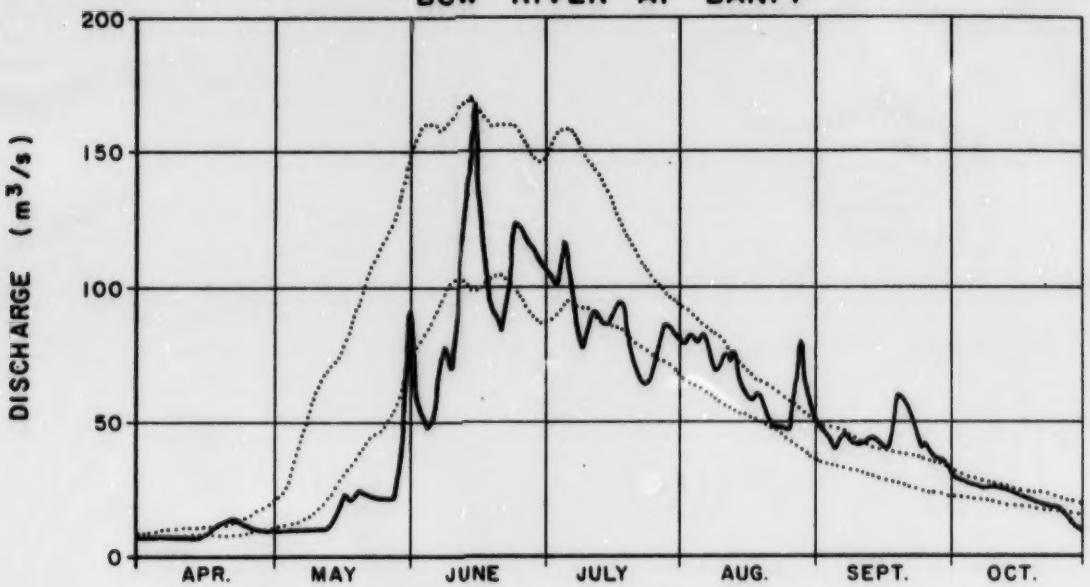
— — — AVERAGE

——— 1984

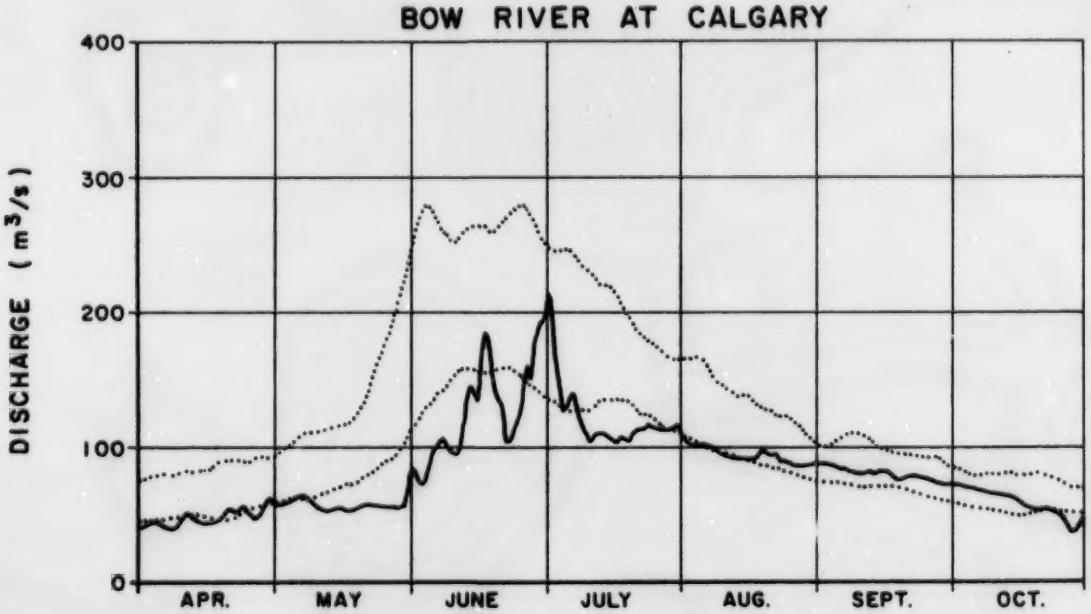
Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
		SUMMER PRECIPITATION BOW RIVER BASIN
SUBMITTED DATE	DESIGNED CHECKED	
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE DEC., 1984 — FIGURE 17

Alberta ENVIRONMENT

BOW RIVER AT BANFF



BOW RIVER AT CALGARY

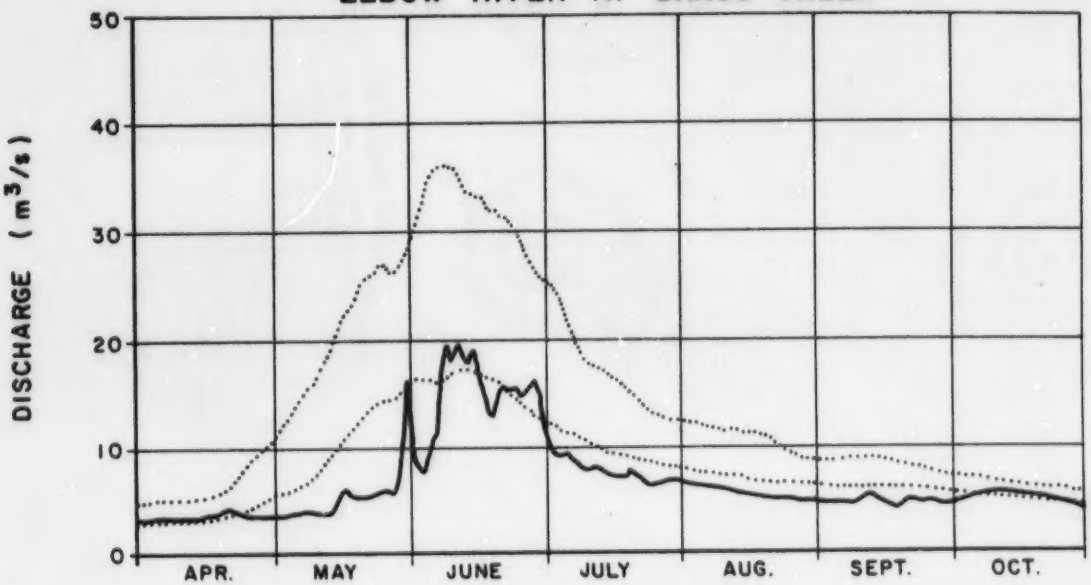


NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of the range of normal behaviour.

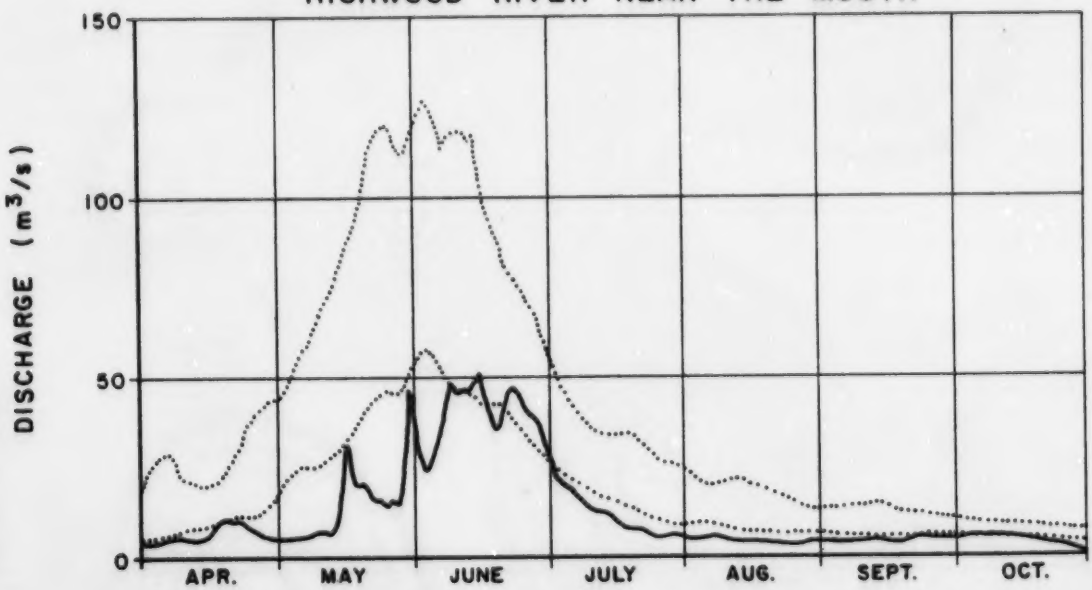
Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
SUBMITTED DATE	DESIGNED CHECKED	STREAMFLOW HYDROGRAPHS BOW RIVER BASIN
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE JAN., 1988 — FIGURE 18

Alberta
ENVIRONMENT

ELBOW RIVER AT BRAGG CREEK



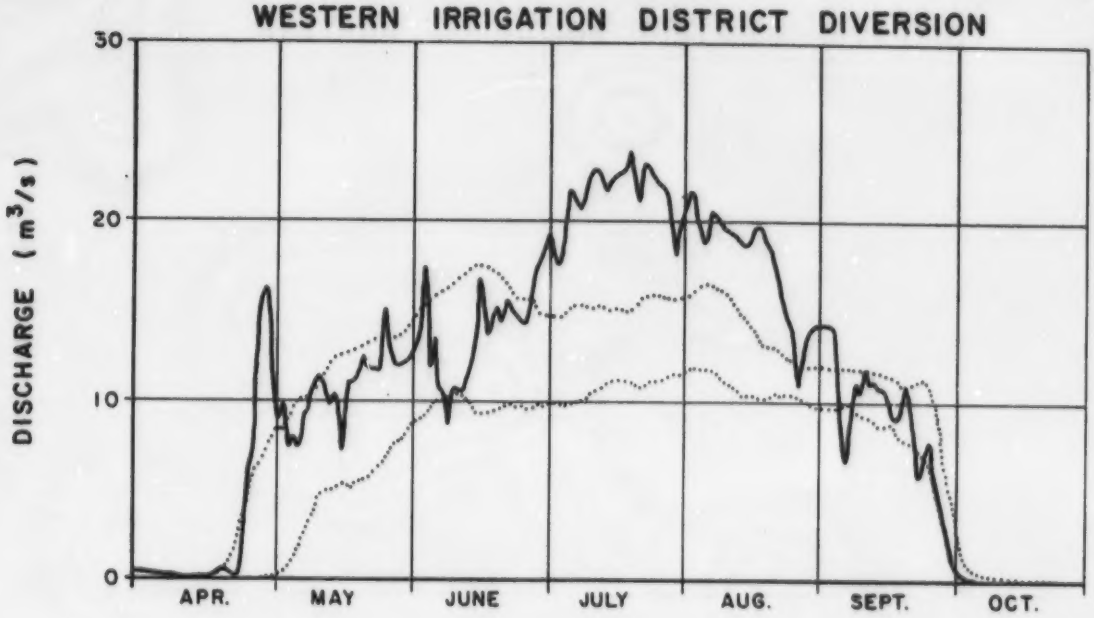
HIGHWOOD RIVER NEAR THE MOUTH

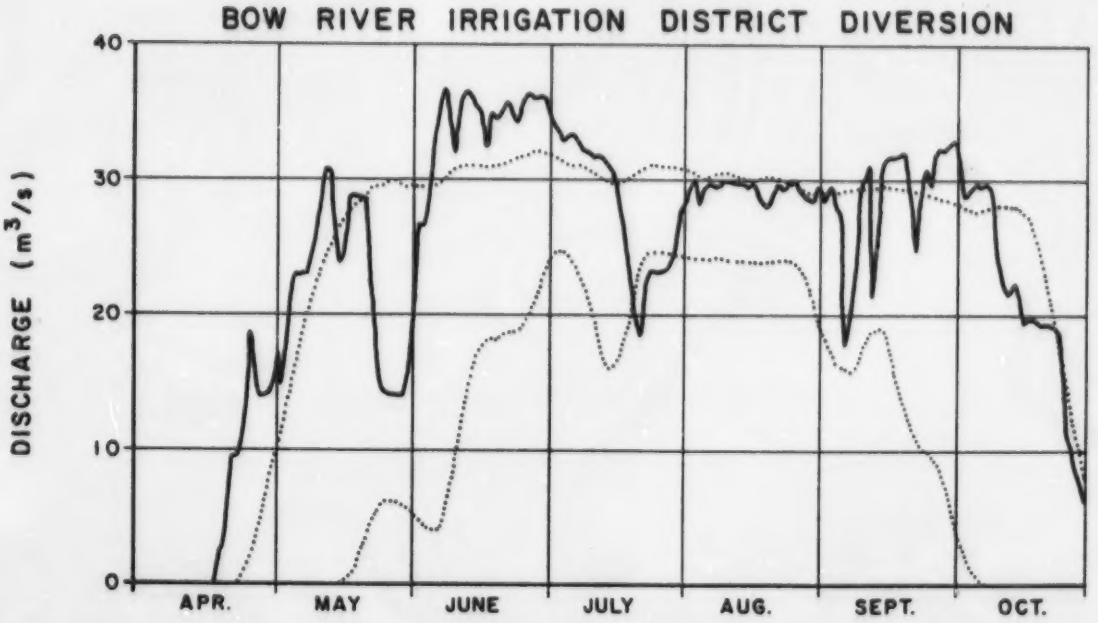


NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of the range of normal behaviour.

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
		STREAMFLOW HYDROGRAPHS BOW RIVER BASIN
SUBMITTED DATE	DESIGNED CHECKED	
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE JAN., 1986 — FIGURE 19

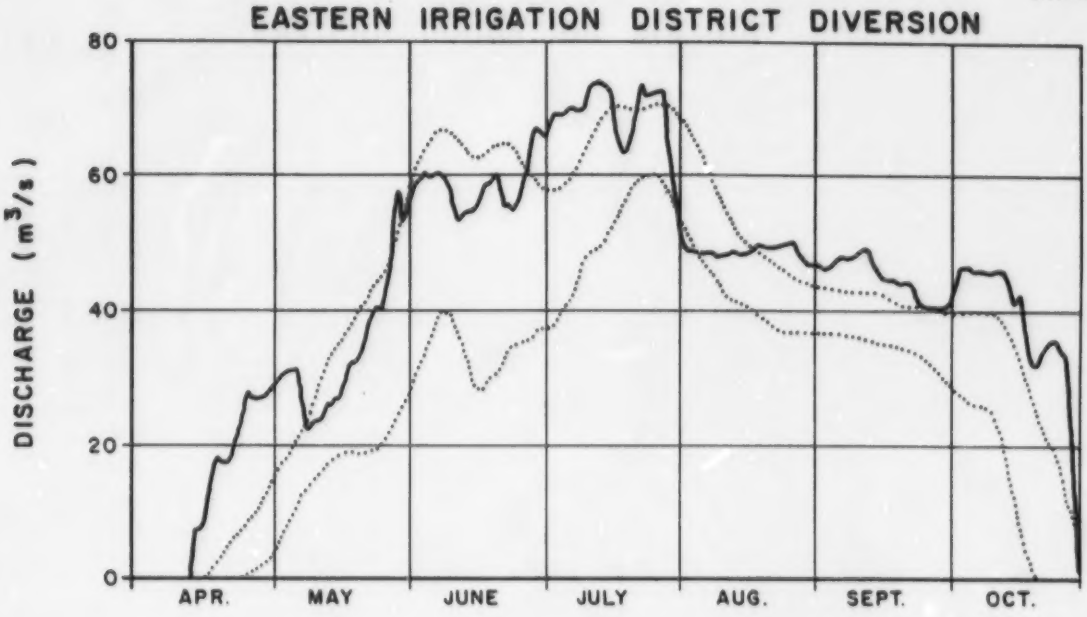
Alberta ENVIRONMENT

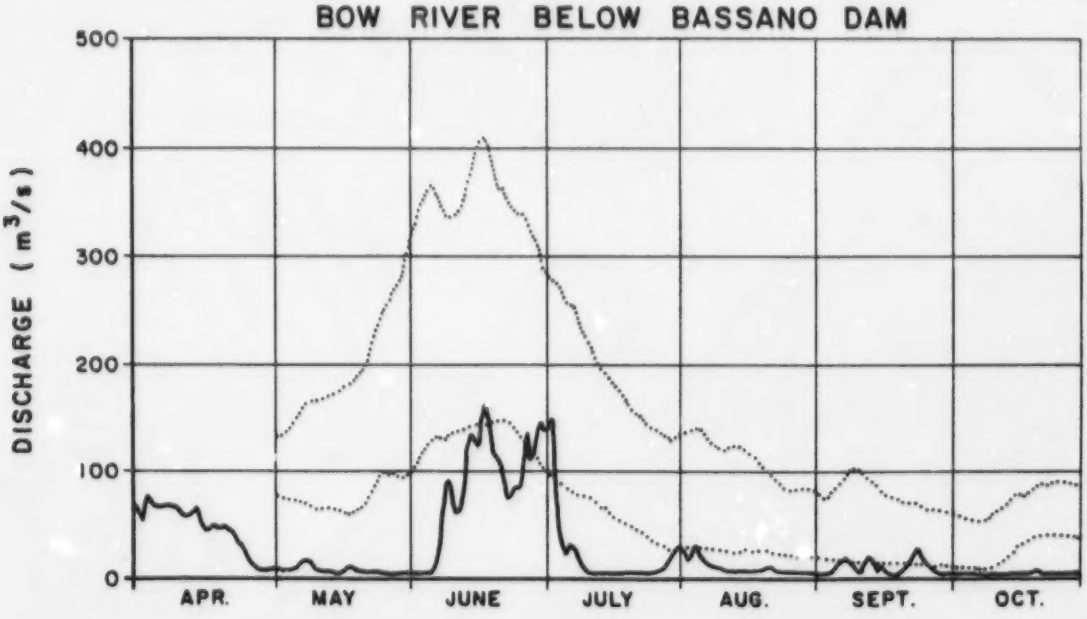




NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of the range of normal behaviour.

Alberta ENVIRONMENT : RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
		STREAMFLOW HYDROGRAPHS BOW RIVER BASIN
SUBMITTED DATE	DESIGNED	
	CHECKED	
APPROVED DATE	DRAWN B. Sanders	SCALE AS SHOWN
	CHECKED	DATE JAN., 1985
		FIGURE 20



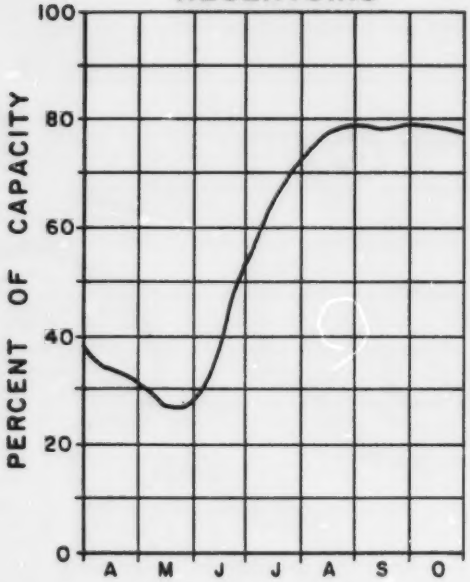


NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of normal range of behaviour.

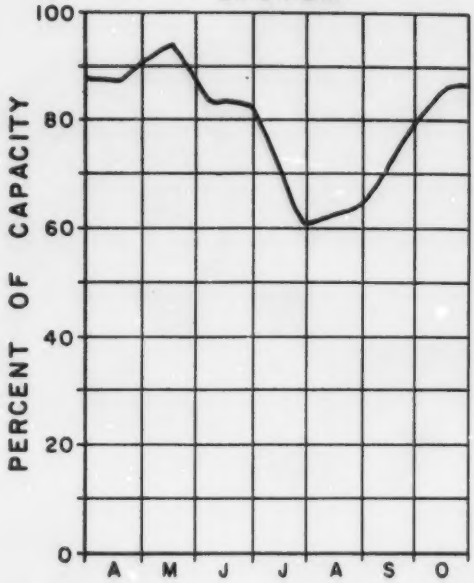
Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
SUBMITTED DATE	DESIGNED CHECKED	STREAMFLOW HYDROGRAPHS BOW RIVER BASIN
APPROVED DATE	DRAWN B. Sanders	SCALE AS SHOWN DATE JAN., 1988 FIGURE 21

Alberta
ENVIRONMENT

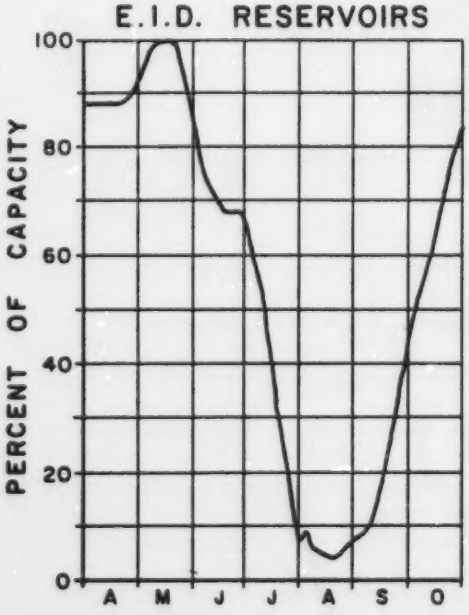
TRANSALTA
BOW RIVER
RESERVOIRS



McGREGOR - TRAVERS
SYSTEM



E.I.D. RESERVOIRS



Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
SUBMITTED DATE	DESIGNED CHECKED	RESERVOIR STORAGE BOW RIVER BASIN
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE DEC., 1984 — FIGURE 22

Alberta
ENVIRONMENT

RED DEER RIVER BASIN

WEATHER CONDITIONS IN 1984

Winter snowfall in the headwaters and plains areas of the Red Deer River Basin was generally about 70 percent of average. Much of the snowpack in the plains areas was depleted by warm winter weather prior to the spring snowmelt period. Spring snowmelt runoff was very light as a result.

Spring precipitation was close to average in the Basin but cold weather predominated from mid-April to late May resulting in a delay of several weeks to the mountain snowmelt runoff.

Summer rainfall was much below average throughout the Basin. Autumn precipitation was much above average. September and October were relatively cold months as well. The cold, wet autumn has resulted in a general improvement of soil moisture conditions for the spring of 1985.

Graphs of precipitation accumulation for Sundre and Red Deer for the May-October period as compared to average values are presented in Figure 23.

STREAMFLOW CONDITIONS IN 1984

After a brief period of plains area snowmelt runoff in late March, streamflow conditions remained generally below average for the rest of the season in the basin. Streamflow downstream of the Dickson Dam was very low throughout the summer as Gleniffer Lake was being filled. Hydrographs for the April-October period for the primary headwaters station, below Burnt Timber Creek, and for Red Deer are presented as Figure 24.

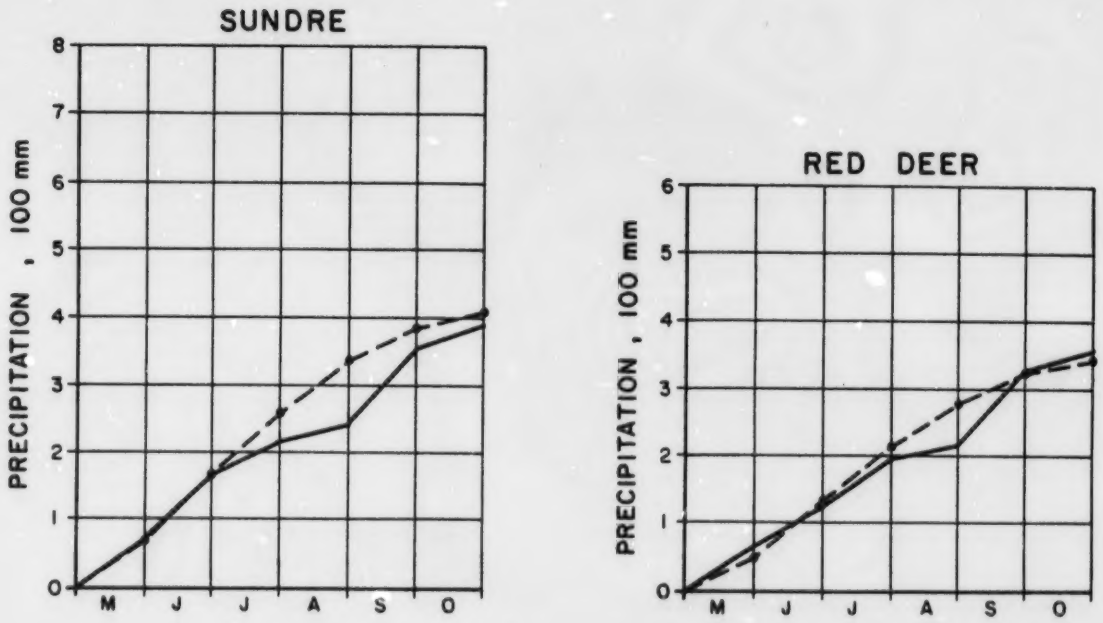
WATER SUPPLY CONDITIONS IN 1984

In early May 1984, it was forecast that the natural flow of the Red Deer River would be about 75 percent of average for the April-September period. The actual volume for this period was only 42 percent of average. The discrepancy between the forecast and the actual volume is the result of much below average rainfall in the headwaters of the Basin during the summer.

WATER STORAGE CONDITIONS IN 1984

Although the water supply for 1984 was much below average, it was still possible to fill Gleniffer Lake by the end of July. A graph of the storage pattern for the Dickson Dam reservoir is presented in Figure 25. A more detailed account of the storage situation as of November 1, 1984 is given in Table 2.

Alberta
ENVIRONMENT



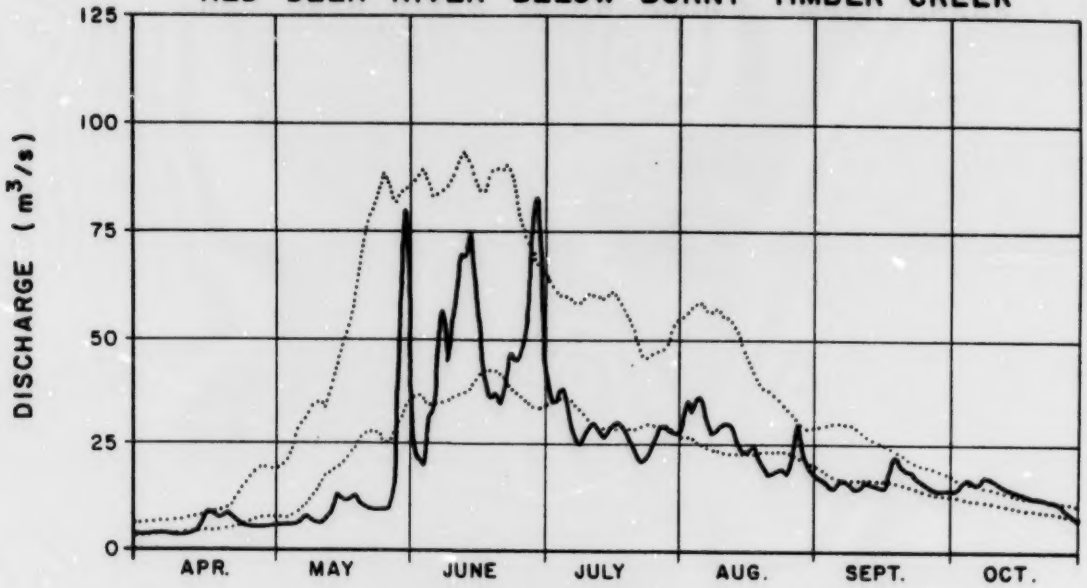
LEGEND

--- AVERAGE
——— 1984

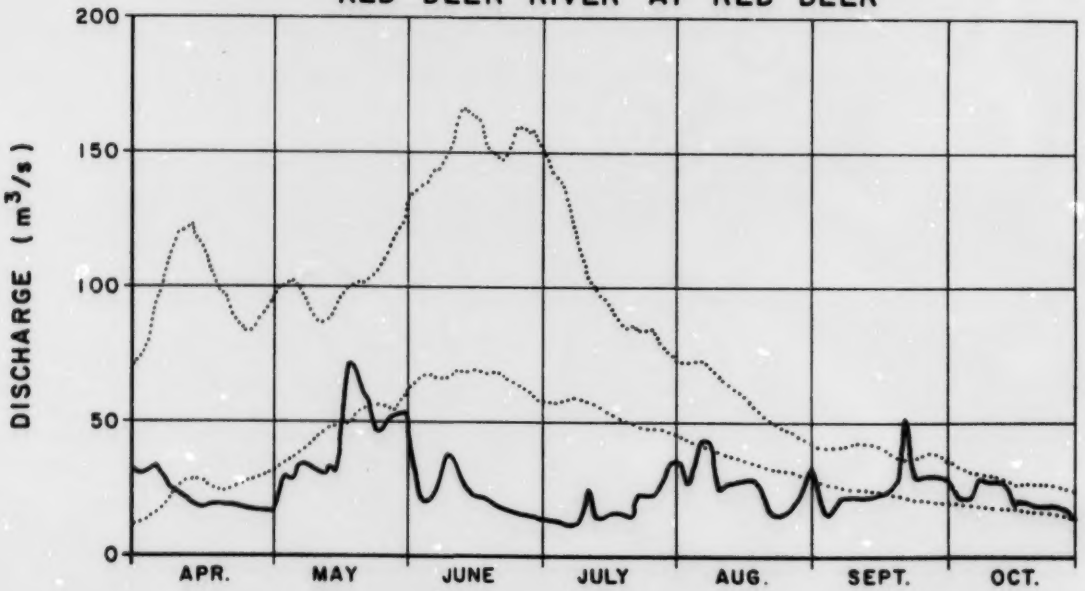
Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN	
SUBMITTED DATE	DESIGNED	SUMMER PRECIPITATION RED DEER RIVER BASIN	
	CHECKED		
APPROVED DATE	DRAWN B. Sanders	SCALE AS SHOWN	FIGURE 23
	CHECKED	DATE DEC., 1984	

Alberta ENVIRONMENT

RED DEER RIVER BELOW BURNT TIMBER CREEK



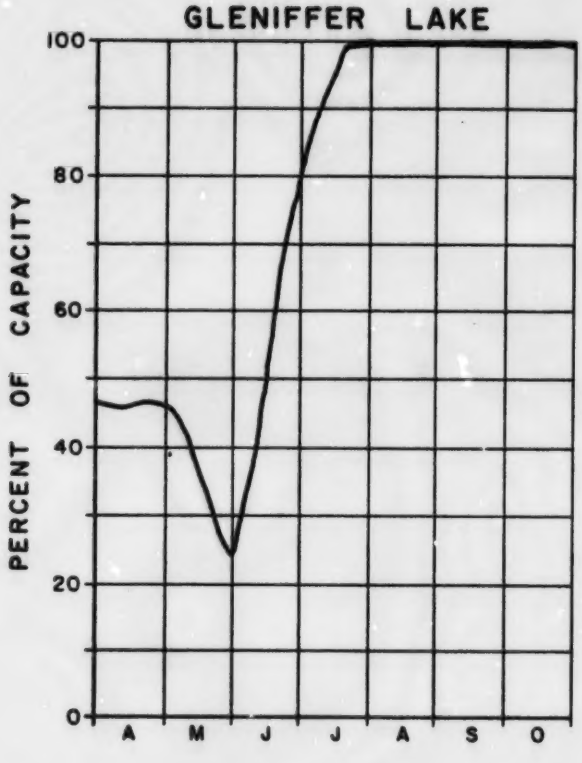
RED DEER RIVER AT RED DEER



NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of normal range of behaviour.

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
		STREAMFLOW HYDROGRAPHS RED DEER RIVER BASIN
SUBMITTED DATE	DESIGNED CHECKED	
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE JAN., 1988 — FIGURE 24

Alberta
ENVIRONMENT



Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN	
SUBMITTED DATE	DESIGNED CHECKED	RESERVOIR STORAGE RED DEER RIVER BASIN	
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE DEC., 1984	FIGURE 25

NORTH SASKATCHEWAN RIVER BASIN

WEATHER CONDITIONS IN 1984

As in other parts of central and southern Alberta, the winter of 1983-84 produced below average snowpacks in the headwaters and the plains areas of the North Saskatchewan River Basin. Warm winter weather depleted much of the plains area snowpack before the spring snowmelt period. Consequently, plains area spring runoff was very light.

Springtime produced close to average precipitation in the Basin headwaters and above average rainfall in the plains areas. This period was relatively cold.

The summer was hot and dry throughout the Basin. Autumn was cold and wet. The autumn weather resulted in general improvement of soil moisture conditions for the spring of 1985.

Graphs of precipitation accumulation throughout the spring, summer and autumn for Rocky Mountain House and Edmonton as compared to average values are presented in Figure 26.

STREAMFLOW CONDITIONS IN 1984

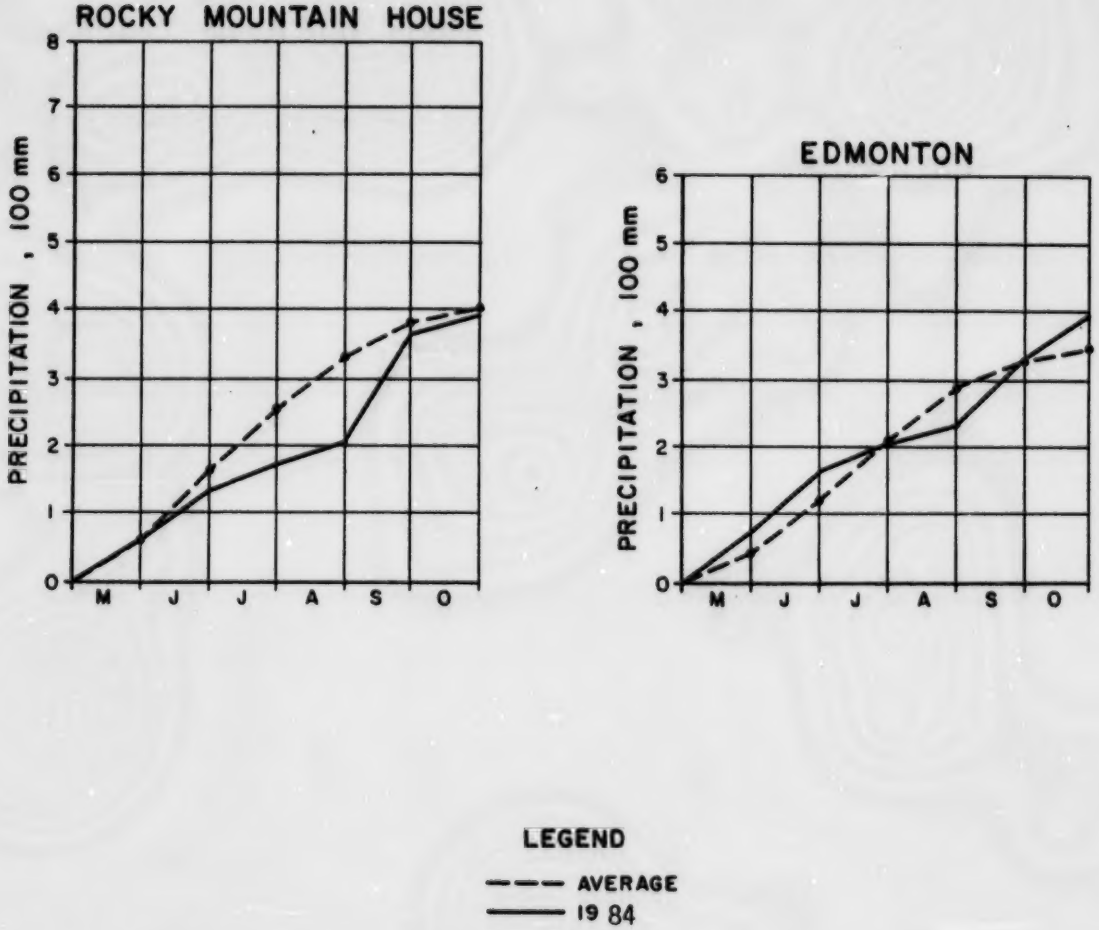
Spring snowmelt runoff began in the plains areas in late March. Soon after this period, streamflow fell to below average and remained in that state until October. Graphs of streamflow conditions at Rocky Mountain House and Edmonton for the April-October period are presented in Figure 27.

WATER SUPPLY CONDITIONS IN 1984

In early May 1984, it was forecast that the natural flow volume of the North Saskatchewan River would be 89 percent of average for the April to September period. The actual volume was only 67 percent of average. The discrepancy between the forecast and the actual volume is the result of much below average rainfall during the summer.

WATER STORAGE CONDITIONS IN 1984

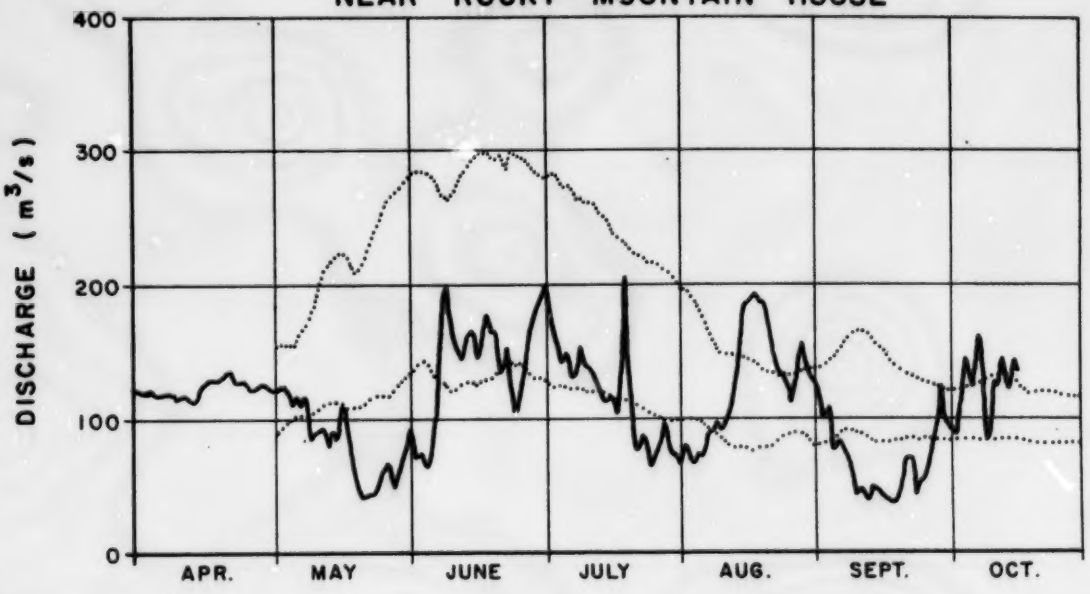
Despite the low water supply, the hydroelectric power water storage reservoirs in the headwaters of the Basin reached satisfactory levels by the end of the runoff season. A graph of the storage pattern for Lake Abraham and the Brazeau Reservoir taken together for the April-October period is presented in Figure 28. A more detailed account of the storage status as of November 1, 1984 is given in Table 2.



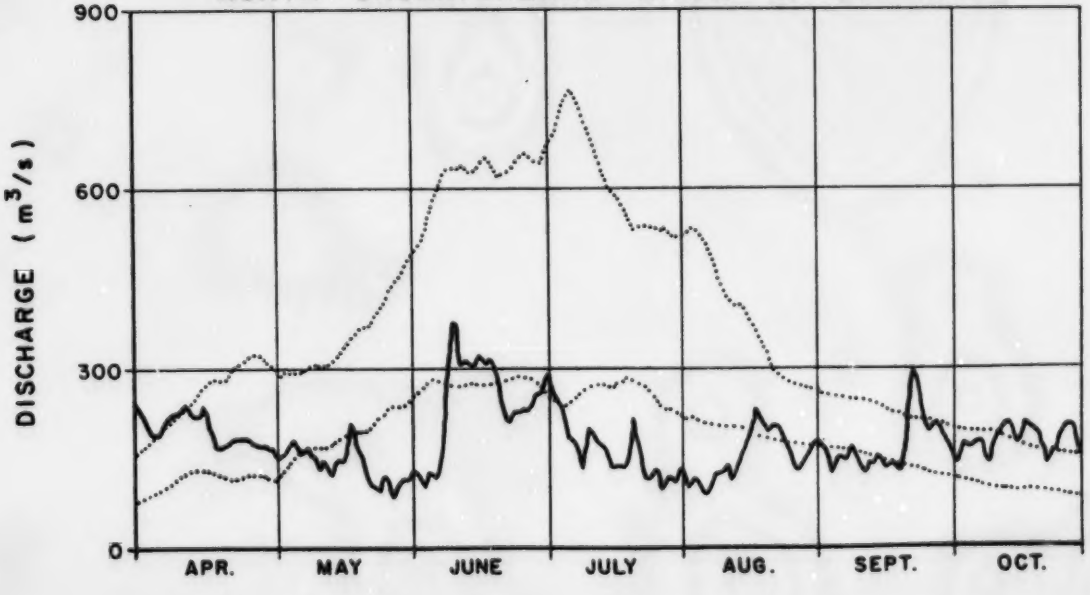
Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
SUBMITTED DATE	DESIGNED	SUMMER PRECIPITATION
APPROVED DATE	DRAWN B. Sanders	NORTH SASKATCHEWAN RIVER BASIN
		SCALE AS SHOWN — FIGURE 26
		DATE DEC., 1984

Alberta ENVIRONMENT

NORTH SASKATCHEWAN RIVER NEAR ROCKY MOUNTAIN HOUSE



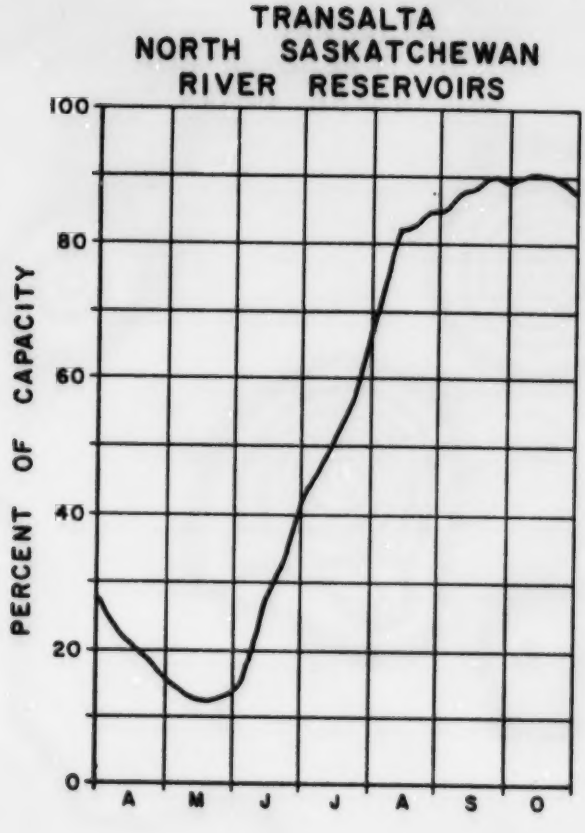
NORTH SASKATCHEWAN RIVER AT EDMONTON



NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of the range of normal behaviour.

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
SUBMITTED DATE	DESIGNED CHECKED	STREAMFLOW HYDROGRAPHS NORTH SASKATCHEWAN RIVER BASIN
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN · DATE JAN., 1988 · FIGURE 27

Alberta
ENVIRONMENT



Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN	
SUBMITTED DATE	DESIGNED CHECKED	RESERVOIR STORAGE NORTH SASKATCHEWAN RIVER BASIN	
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE DEC., 1984	FIGURE 28

Alberta
ENVIRONMENT

APPENDIX A

SNOW SURVEY
AND
STORAGE GAUGE DATA

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SNOW SURVEY ACTIVITIES

In 1983-84, Alberta Environment operated thirty eight snow courses in the mountainous areas of the Province and sixty four in the plains. The following tables contain a summary of all the data collected at these sites in the winter of 1983-84 as well as information on the location of each course.

The main purpose of the snow network is to provide data to the River Forecast Centre to enable them to produce the Water Supply Outlook and make flood forecasts when necessary. For this reason the snow data are included in the Water Supply Outlook which are issued on March 1st, April 1st, May 1st and June 1st. In addition the data will be published along with snow data from other Provinces, by the Atmospheric Environment Service, in their annual publication, Snow Cover Data for Canada.

A historical summary containing all data collected in previous years at the snow courses included in this report is available upon request. This summary also includes data from discontinued snow courses. It should be noted that the snow courses are measured at approximately the same date every year. If the measurement cannot be carried out either six days before or six days after the first day of the month, they are not included in the summary.

In addition to the snow courses, data were collected from fifteen snow pillows in 1983-84. Ten of these pillows were equipped to give data on a real time basis. The primary purpose of snow pillows is to provide an indication of the snow melt rate at higher elevations. On page A-14 is a list of all snow pillows operated in 1983 - 1984. Graphs for the pillows which operated satisfactorily are presented on pages A-15 through A-29. The graphs indicate the accumulation and depletion of the water equivalent of the snow pack over the winter. Also shown for comparison purposes are the results of snow surveys carried out by conventional methods at adjacent snow courses.

In 1983 - 1984 two new snow courses were established.

Following are the details on the new courses.

New Courses	Approximate Latitude	Location Longitude	Elevation Metres	River Basin
Gardiner Snow Pillow	49°21'	114°01'	1970	Oldman
Lost Creek	59°10'	114°43'	2160	Oldman
Discontinued Snow Pillow				
Embarras Portage	58°23'	111°32'	700	Peace

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For further information on snow data, please contact.

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ALBERTA SNOW COURSE DATA
MOUNTAIN AREA

Alberta ENVIRONMENT

Station Name	Date of Survey (Mo-Day)	Snow Depth (cm) 1984	Water Equivalent (mm) 1984	1983	Prior to 1984 Max.	Min.	Ave.	Total Years of Record
OLDMAN RIVER BASIN								
Akamina*	01-26	78	191	384	384	295	339	4
	02-28	102	254	455	472	396	432	5
	03-27	116	307	503	663	432	541	5
	05-01	103	371	475	691	320	465	5
	05-29	36	160	0	378	0	189	3
Allison Pass	02-01	77	193	310	310	259	285	3
	02-28	97	236	350	566	350	427	5
	03-27	112	307	399	823	302	504	21
	05-01	92	333	384	617	384	504	4
Lee Creek "D"	02-28	24	56	117	444	81	190	11
	03-28	19	46	119	615	117	233	10
Lee Creek "E"	02-28	59	156	152	267	91	178	7
	03-28	59	147	165	536	165	274	8
Lee Creek "F"	02-28	28	76	97	231	97	156	9
	03-28	22	53	99	356	60	193	10
Lee Creek "P"	02-28	17	48	91	366	84	169	11
	03-28	18	41	104	358	61	179	12
Lee Creek "Q"	02-28	N/A	N/A	107	320	97	167	14
	03-28	33	104	157	315	91	182	13
Middle Drywood	03-27	17	36	69	97	0	47	19
Racehorse Creek*	02-01	71	188	338	338	338	338	2
	02-28	92	254	447	447	447	447	2
	03-27	102	320	N/A	N/A	N/A	N/A	1
	05-01	92	330	508	508	508	508	2
	05-29	54	216	94	94	94	94	2
Westcastle Bush	01-31	56	160	343	343	236	290	3
	02-28	72	198	391	429	277	366	4
	03-27	78	226	396	846	244	474	18
	05-01	48	168	335	533	335	434	3
Wilkinson Summit (Bush)	03-27	62	137	112	460	112	222	21
Wilkinson Summit (Open)	03-27	50	99	94	417	94	189	20

* Snow pillow data also available at these sites.

ALBERTA SNOW COURSE DATA
MOUNTAIN AREA

Alberta ENVIRONMENT

Station Name	Date of Survey (Mo-Day)	Snow Depth (cm) 1984	Water Equivalent (mm) 1984	1983	Prior to 1984 Max.	Min.	Ave.	Total Years of Record
ST. MARY RIVER BASIN**								
Iceberg Lake Trail	04-25	111	422	536	1336	0	687	61
Peigan Pass	04-26	177	665	937	1671	145	930	61
Mt. Allen	04-26	221	831	1018	1852	234	1130	61
Ptarmigan Lake	04-25	141	556	709	1618	145	920	47
Josephine Lower	04-26	63	196	277	833	72	441	29
BOW RIVER BASIN								
Bow River	02-02	60	122	152	262	79	171	18
	03-01	60	142	183	386	112	208	18
	03-29	57	142	206	437	97	212	48
Bow Summit (NEW)	02-01	116	244	226	292	178	245	5
	02-29	115	286	295	368	277	333	7
	03-28	112	330	340	434	340	374	6
	05-03	95	312	320	439	305	360	6
	05-30	70	234	0	262	0	141	4
Chateau Lawn	02-02	61	140	191	284	122	219	16
	03-01	69	170	241	401	155	266	16
	03-29	71	196	277	480	135	276	43
Cuthead Lake	02-29	116	312	249	279	249	264	3
	03-28	117	330	302	490	302	401	6
	05-03	103	333	318	485	318	408	6
	05-30	87	318	236	404	56	274	6
Highwood Bush	01-31	96	231	251	439	132	280	10
	02-28	106	254	297	439	241	344	12
	03-27	122	330	325	681	259	395	15
	05-01	121	358	411	726	221	466	21
	05-29	110	401	216	455	216	348	4
Katherine Lake	03-28	135	389	373	521	371	422	4
		N/A	N/A	284	541	284	442	4
	05-30	123	498	N/A	554	363	434	4

** Data collected in cooperation with the U.S. Soil Conservation Service.

ALBERTA SNOW COURSE DATA
MOUNTAIN AREA

Alberta ENVIRONMENT

Station Name	Date of Survey (Mo-Day)	Snow Depth (cm) 1984	Water Equivalent (mm) 1984	1983	Prior to 1984 Max.	Min.	Ave.	Total Years of Record
BOW RIVER BASIN								
Larch Valley	02-29	126	345	368	399	368	384	3
	03-28	127	378	409	475	409	445	5
	05-03	121	417	424	546	424	483	6
	05-30	114	444	271	483	271	375	5
Little Elbow Summit*	01-31	69	147	185	249	122	182	6
	02-28	85	188	262	262	218	243	6
	03-27	102	234	271	348	272	297	6
	05-01	101	287	394	394	259	342	6
	05-29	85	292	208	373	208	291	4
Mirror Lake	02-02	87	203	185	348	109	217	18
	03-01	94	239	229	483	142	260	18
	03-29	92	239	284	561	160	301	45
Mist Creek	03-27	59	150	203	302	140	206	8
	05-01	13	38	178	523	0	199	19
Mud Lake	01-31	75	160	236	236	213	225	3
	02-28	81	163	252	295	252	274	3
	03-27	95	257	297	424	269	330	7
	05-01	73	241	335	551	206	368	11
	05-29	32	122	0	272	0	136	3
Pipestone, Upper	02-02	67	137	173	279	89	167	18
	03-01	69	157	183	376	107	217	18
	03-29	63	152	229	434	109	212	48
Ptarmigan Hut	02-29	122	323	292	564	213	343	16
	03-28	123	376	328	681	254	416	18
	05-03	103	345	295	658	196	400	18
	05-30	88	338	0	318	0	249	4
Sunshine Village*	02-03	147	343	333	447	317	375	7
	02-29	156	406	406	770	277	497	15
	03-29	159	467	513	996	406	639	18
	05-03	144	508	457	1092	338	656	18
	05-30	130	592	295	627	203	399	6
Tent Ridge	01-31	73	163	244	259	188	230	4
	02-28	80	178	N/A	300	292	296	3
	03-27	98	251	503	653	503	572	4
	05-01	85	254	376	498	345	406	4
	05-29	66	231	0	376	0	188	3

* Snow pillow data also available at these sites.

Alberta ENVIRONMENT

ALBERTA SNOW COURSE DATA
MOUNTAIN AREA

Station Name	Date of Survey (Mo-Day)	Snow Depth (cm) 1984	Water Equivalent (mm) 1984	1983	Prior to 1984 Max.	Min.	Ave.	Total Years of Record
BOW RIVER BASIN								
Three Isle Lake*	01-31	142	376	358	371	358	365	3
	02-28	156	455	445	531	445	488	3
	03-27	171	544	503	653	503	572	4
	05-01	155	572	579	737	579	645	4
	05-29	154	640	345	673	345	535	4
RED DEER RIVER BASIN								
Gable Mountain	02-29	64	135	127	132	127	130	3
	03-28	72	157	132	216	132	174	3
	05-03	45	137	175	229	175	204	4
	05-30	23	81	0	130	0	76	4
McConnell Creek	02-29	54	109	145	185	124	151	4
	03-28	54	122	155	216	155	184	4
	05-03	30	89	76	198	76	150	4
	05-30	0	0	0	109	0	53	4
Skoki Mountain*	02-29	112	284	280	287	280	284	3
	03-28	114	310	302	396	302	350	6
	05-03	108	325	328	414	328	364	6
	05-30	85	335	0	358	0	190	6
NORTH SASKATCHEWAN RIVER BASIN								
Nigel Creek	02-01	114	261	229	528	173	280	14
	02-28	105	292	280	655	185	365	13
	03-28	116	353	333	686	198	424	16
	05-02	97	333	333	752	208	432	14
ATHABASCA RIVER BASIN								
Marmot-Jasper	02-28	69	150	115	208	115	175	5
	03-29	71	176	163	422	152	253	15
	05-02	59	175	152	401	0	231	15
Sunwapta Falls	02-01	47	99	94	183	84	134	14
	02-28	51	107	102	277	79	170	13
	03-28	50	126	130	333	89	203	16
	05-02	30	89	13	340	0	163	15

* Snow pillow data also available at these sites.

ALBERTA SNOW COURSE DATA
PLAINS AREA

Alberta ENVIRONMENT

Station Name	Date of Survey (Mo-Day)	Snow Depth (cm) 1984	Water Equivalent (mm) 1984	1983	Prior to 1984 Max.	Min.	Ave.	Total Years of Record
ATHABASCA RIVER BASIN								
Barrhead, North	02-28	15	31	18	145	18	64	11
	03-15	15	34	33	109	33	60	11
	03-28	0	0	46	147	0	60	10
Barrhead, West	02-28	17	33	13	99	13	57	11
	03-15	24	46	28	84	28	52	10
	03-27	0	0	53	168	0	53	10
Edson II	02-29	25	65	36	155	36	78	10
	03-15	38	86	54	165	25	79	11
	03-29	12	36	53	168	0	66	10
Embarras Portage	01-31	36	48	N/A	76	52	60	5
	02-29	36	65	102	102	41	69	10
	03-15	36	62	97	112	48	79	11
	03-28	22	43	86	99	38	65	8
Flatbush	02-27	22	51	28	99	28	70	11
	03-14	30	54	43	112	43	72	10
	03-28	0	0	45	175	0	75	9
Fort Chipewyan Airport*	02-02	31	38	86	86	28	51	10
	02-27	31	44	122	122	28	67	10
	03-13	33	55	152	152	28	79	12
	03-26	30	55	127	127	41	86	11
Grassland	02-28	14	33	37	102	8	51	11
	03-14	13	36	46	107	10	49	10
	03-27	0	0	58	130	0	58	10
High Prairie	02-28	0	0	28	132	13	71	11
	03-13	0	0	29	112	29	68	10
	03-26	0	0	52	185	0	83	9
Highrock Tower	01-31	33	43	114	114	25	54	9
	02-27	39	64	122	122	30	70	10
	03-16	38	64	130	130	33	77	10
	03-26	37	61	142	142	38	84	9
Hinton	02-29	46	104	51	122	41	71	10
	03-15	56	121	67	152	23	86	11
	03-29	38	109	68	157	0	79	10

* Snow pillow data also available for this site.

Alberta ENVIRONMENT

ALBERTA SNOW COURSE DATA
PLAINS AREA

Station Name	Date of Survey (Mo-Day)	Snow Depth (cm) 1984	Water Equivalent (mm) 1984	1983	Prior to 1984 Max.	Min.	Ave.	Total Years of Record
ATHABASCA RIVER BASIN								
Jackfish Village	01-31	36	38	55	76	41	53	8
	02-29	36	60	91	94	43	70	8
	03-15	35	65	97	102	33	74	10
	03-28	27	60	94	104	23	78	10
Kinuso	02-27	27	58	43	107	23	75	11
	03-14	32	64	52	130	38	75	10
	03-29	0	0	43	163	0	76	9
Lodgepole	02-29	37	82	42	137	42	82	11
	03-15	42	92	59	157	28	80	19
	03-29	17	49	74	165	0	79	12
Mayerthorpe Snow Pillow*	02-03	30	43	23	114	23	69	3
	02-28	31	54	36	114	36	75	9
	03-15	37	71	51	152	51	102	11
	03-29	6	18	59	150	59	105	3
Meadowview	02-28	23	46	30	137	30	77	12
	03-15	30	58	46	132	41	71	20
	03-29	6	15	54	160	0	76	11
Obed	02-29	27	76	29	165	0	71	10
	03-15	36	91	45	178	0	86	11
	03-29	17	50	63	196	0	80	10
Perryvale, East	02-28	22	50	32	137	32	65	11
	03-14	25	51	37	94	37	65	10
	03-27	4	12	36	150	0	67	9
Saulteaux River	02-27	27	53	38	112	38	73	11
	03-14	27	52	52	109	48	73	10
	03-28	5	5	61	198	23	81	9
Twin Lakes*	02-03	23	33	18	84	18	51	3
	02-28	25	48	28	94	28	61	3
	03-15	31	54	31	109	31	80	3
	03-29	5	11	43	119	43	81	3
Westlock	02-27	18	44	28	130	13	57	13
	03-14	17	28	34	112	0	57	20
	03-28	0	0	45	160	0	49	10

* Snow pillow data also available for this site.

ALBERTA SNOW COURSE DATA
PLAINS AREA

Alberta ENVIRONMENT

Station Name	Date of Survey (Mo-Day)	Snow Depth (cm) 1984	Water Equivalent (mm) 1984	1983	Prior to 1984 Max.	Min.	Ave.	Total Years of Record
ATHABASCA RIVER BASIN								
Whitecourt	02-27	19	45	28	157	28	84	11
	03-14	24	52	32	127	32	83	10
	03-29	0	0	49	157	0	75	9
CHURCHILL RIVER BASIN								
Bonnyville, North	02-28	30	53	35	119	35	60	10
	03-15	34	62	49	102	25	58	10
	03-29	9	22	53	155	0	66	10
NORTH SASKATCHEWAN RIVER BASIN								
Bellis	02-28	33	59	39	122	39	71	11
	03-14	39	77	56	112	56	79	10
	03-29	17	46	55	152	29	86	8
Brazeau Reservoir	02-27	35	79	51	94	51	71	8
	03-14	44	91	62	127	41	75	8
	03-28	25	58	61	126	0	58	8
Brown Creek	02-27	41	86	43	132	36	61	8
	03-14	48	97	51	137	31	63	7
	03-28	37	88	54	147	18	67	8
Bruce Snow Pillow *	02-03	26	51	N/A	58	25	40	5
	03-01	34	57	30	74	30	53	9
	03-16	36	66	46	97	43	68	10
	03-27	18	48	44	94	10	69	9
Clandonald	02-29	33	70	41	122	13	55	11
	03-15	31	63	43	81	20	54	10
	03-29	9	21	38	168	0	60	10
Coronation II	02-27	20	47	36	99	13	41	11
	03-14	25	61	0	102	0	29	9
	03-26	12	41	0	165	0	31	10
Crimson Lake	02-27	26	68	61	99	8	64	11
	03-14	38	89	53	114	0	70	9
	03-28	22	77	64	122	0	69	10

* Snow pillow data also available for this site.

ALBERTA SNOW COURSE DATA
PLAINS AREA

Alberta ENVIRONMENT

Station Name	Date of Survey (Mo-Day)	Snow Depth (cm) 1984	Water Equivalent (mm) 1984	1983	Prior to 1984 Max.	Min.	Ave.	Total Years of Record
NORTH SASKATCHEWAN RIVER BASIN								
Elk Island Park	02-29	34	54	28	152	28	73	11
	03-15	33	63	32	114	27	71	10
	03-27	17	44	48	180	0	84	8
Gadsby	02-27	18	42	8	99	0	38	11
	03-14	18	37	0	64	0	23	10
	03-26	0	0	0	135	0	21	12
Leduc	02-29	22	51	41	130	41	77	11
	03-16	15	34	42	130	38	72	10
	03-29	0	0	38	168	0	68	10
Lougheed	03-01	25	53	30	74	30	50	10
	03-16	27	53	36	79	0	46	10
	03-26	2	4	13	119	0	54	9
Mannville	03-01	27	61	36	104	30	54	10
	03-16	30	73	37	81	0	45	10
	03-28	6	17	47	109	0	46	9
Morinville	02-27	17	44	17	130	17	54	11
	03-14	12	25	36	94	20	53	10
	03-28	0	0	32	170	0	58	9
Nordegg	02-27	29	71	62	90	6	48	10
	03-14	43	91	57	89	15	61	9
	03-28	32	86	75	109	0	68	10
Onoway	02-28	17	37	15	109	15	57	11
	03-15	19	44	22	112	8	48	10
	03-29	0	0	2	196	0	48	9
Pipestone Creek*	02-03	31	71	N/A	79	30	53	5
	02-29	23	51	28	102	18	60	9
	03-16	24	53	24	137	0	53	9
	03-29	2	6	39	124	0	45	7
Saint Paul	02-29	22	48	24	99	13	48	11
	03-15	22	62	14	99	14	45	10
	03-29	1	3	17	117	0	49	10
Two Hills	02-29	24	63	37	124	28	57	11
	03-15	23	61	41	76	29	49	10
	03-29	0	0	52	152	0	63	9

* Snow pillow data also available for this site.

ALBERTA SNOW COURSE DATA
PLAINS AREA

Alberta ENVIRONMENT

Station Name	Date of Survey (Mo-Day)	Snow Depth (cm) 1984	Water Equivalent (mm) 1984	1983	Prior to 1984 Max.	Min.	Ave.	Total Years of Record
NORTH SASKATCHEWAN RIVER BASIN								
Wainwright	03-01	22	49	40	51	28	39	9
	03-16	24	54	31	56	0	36	10
	03-29	6	17	44	150	0	37	9
Waskatenau	02-28	14	40	31	117	30	61	11
	03-14	9	23	38	86	38	62	10
	03-27	0	0	46	147	0	69	9
Wetaskiwin	02-29	15	34	23	69	0	40	11
	03-15	15	32	25	97	0	40	9
	03-29	0	0	18	99	0	27	9
PEACE RIVER BASIN								
Bezanson	02-28	0	0	55	145	41	75	10
	03-12	8	10	64	144	18	79	11
	03-26	0	0	75	193	0	72	9
Eureka River	02-28	36	60	60	127	51	77	11
	03-12	38	66	48	122	48	85	10
	03-27	17	48	34	155	0	74	8
Fairview	02-28	17	34	36	130	22	74	11
	03-12	21	41	42	117	16	84	11
	03-27	0	0	43	112	0	68	8
Girouxville	02-28	8	22	37	130	28	67	11
	03-13	7	17	27	127	0	62	10
	03-26	0	0	32	124	0	55	9
Hythe	02-28	0	0	61	142	30	71	11
	03-12	9	10	66	151	0	64	10
	03-26	0	0	110	173	0	63	9
Little Smoky River	02-27	25	48	47	141	47	89	9
	03-13	27	48	35	146	0	87	11
	03-26	0	0	27	164	0	83	8
North Star Manning	02-28	0	0	74	86	0	45	10
	03-12	0	0	75	99	0	45	10
	03-27	0	0	80	107	0	52	8

* Snow pillow data also available for this site.

ALBERTA SNOW COURSE DATA
PLAINS AREA

Alberta ENVIRONMENT

Station Name	Date of Survey (Mo-Day)	Snow Depth (cm) 1984	Water Equivalent (mm) 1984	1983	Prior to 1984 Max.	Min.	Ave.	Total Years of Record
PEACE RIVER BASIN								
Rycroft	02-29	0	0	37	127	0	58	11
	03-12	7	8	54	126	0	50	10
	03-27	0	0	58	155	0	64	8
Sexsmith	02-28	15	33	50	190	36	94	11
	03-12	14	27	65	160	36	95	10
	03-26	0	0	91	218	48	109	8
Spring Creek #1*	01-30	38	52	27	137	27	86	18
	02-27	30	60	56	180	56	116	18
	03-12	36	64	34	213	34	121	17
	03-26	0	0	50	216	10	11	17
Spring Creek #2*	01-30	31	48	24	130	24	79	18
	02-29	24	53	50	166	50	107	18
	03-12	25	41	27	198	27	106	17
	03-26	0	0	40	208	10	95	17
Spring Creek #3	01-30	36	41	44	145	44	86	18
	02-27	30	69	48	180	48	112	17
	03-12	32	62	33	206	33	118	17
	03-26	0	0	53	216	0	109	17
Spring Creek #4	01-30	36	60	42	140	42	87	17
	02-27	29	67	51	189	51	115	17
	03-12	37	67	43	191	43	117	16
	03-26	20	47	57	224	13	113	16
Sweet Grass	02-01	34	41	N/A	46	25	37	6
	02-28	38	60	140	140	36	66	8
	03-15	N/A	N/A	137	137	33	66	7
	03-27	34	69	137	137	28	66	8
RED DEER RIVER BASIN								
Bentley	02-28	17	40	48	79	7	44	11
	03-15	19	34	24	79	0	42	8
	03-27	0	0	14	150	0	51	10
Dickson (Innisfail West)	02-28	15	34	38	97	38	60	11
	03-14	20	37	18	124	0	59	8
	03-27	0	0	16	112	0	57	10

* Snow pillow data also available for this site.

ALBERTA SNOW COURSE DATA
PLAINS AREA

Alberta ENVIRONMENT

Station Name	Date of Survey (Mo-Day)	Snow Depth (cm) 1984	Water Equivalent (mm) 1984	1983	Prior to 1984 Max.	Min.	Ave.	Total Years of Record
RED DEER RIVER BASIN								
Hoadley	02-28	15	41	25	74	6	44	10
	03-15	24	59	0	102	0	50	10
	03-29	9	30	0	163	0	53	10
Innisfail, (#2) East	02-27	10	27	25	53	0	26	9
	03-14	16	27	10	89	0	29	8
	03-26	0	0	0	122	0	29	9
James River	02-28	34	57	53	107	31	61	10
	03-15	45	81	60	122	41	74	9
	03-28	28	77	71	122	43	81	10
Kneehill Valley (Innisfail, #1 East)	02-27	12	33	61	99	15	54	10
	03-14	18	34	52	112	0	56	10
	03-27	2	9	44	86	0	40	9
Sundre	02-28	20	35	38	84	6	45	10
	03-15	30	53	15	107	0	48	9
	03-28	5	15	0	119	0	46	10

* Snow pillow data also available for this site.

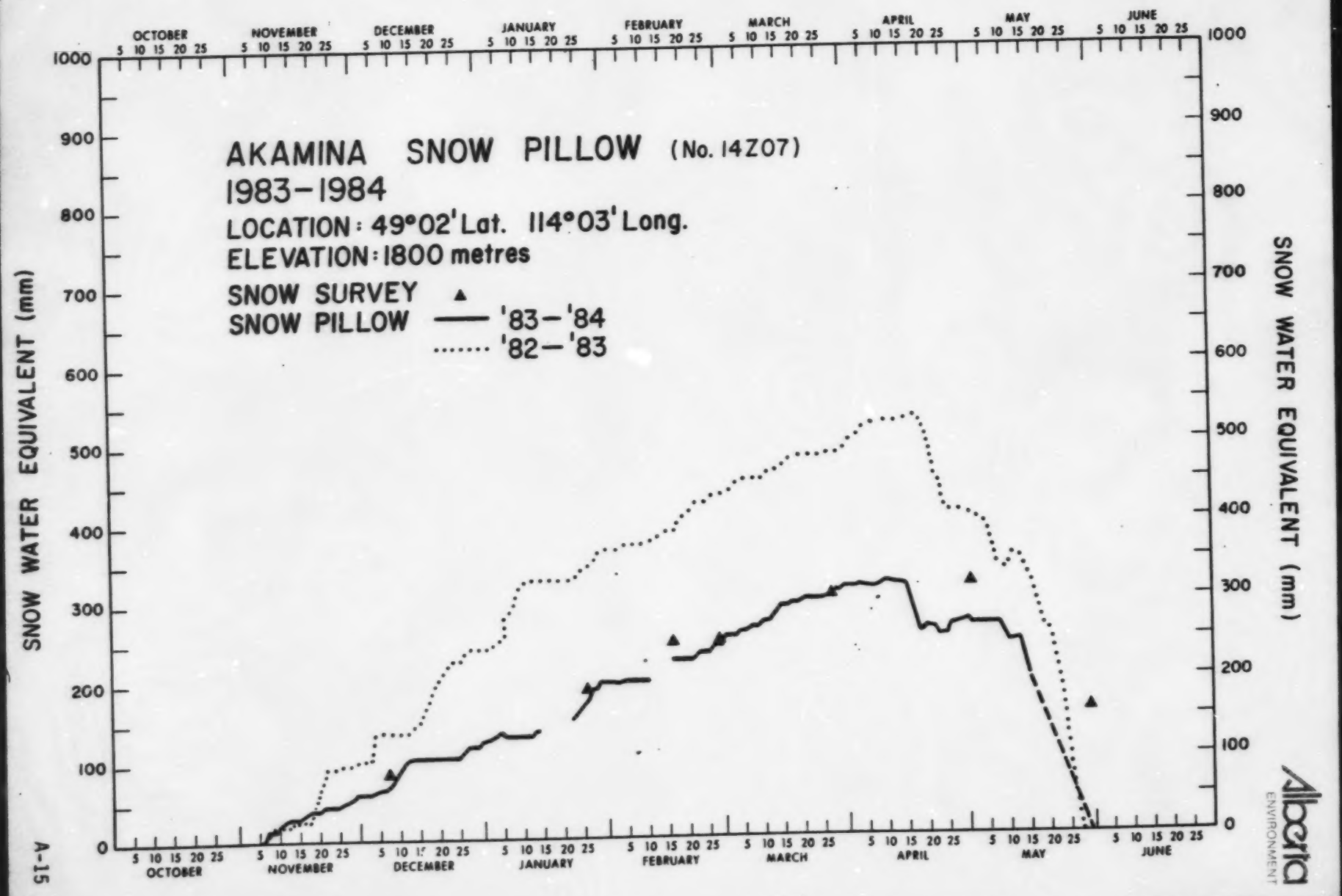
Alberta
ENVIRONMENT

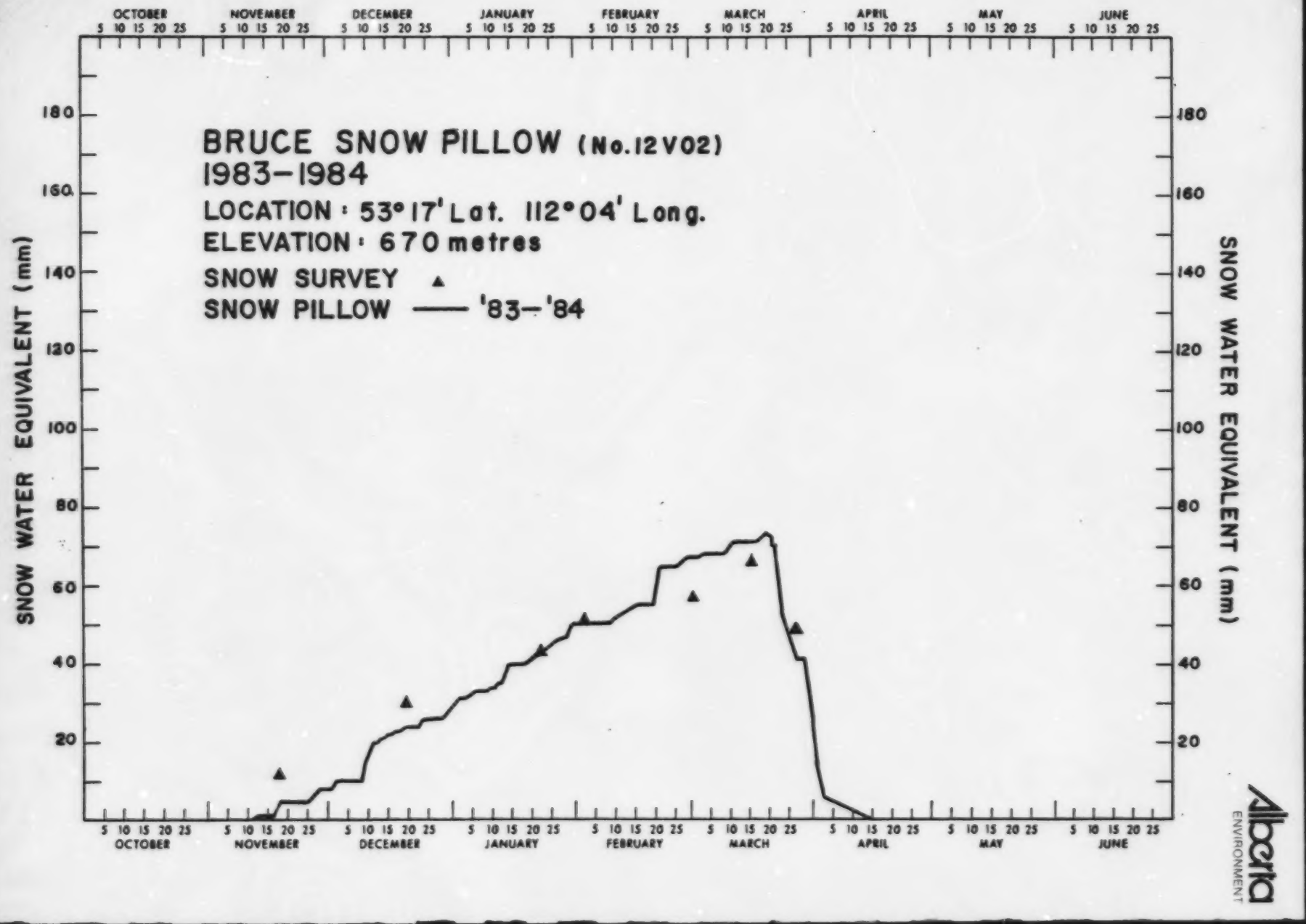
LIST OF PILLOWS

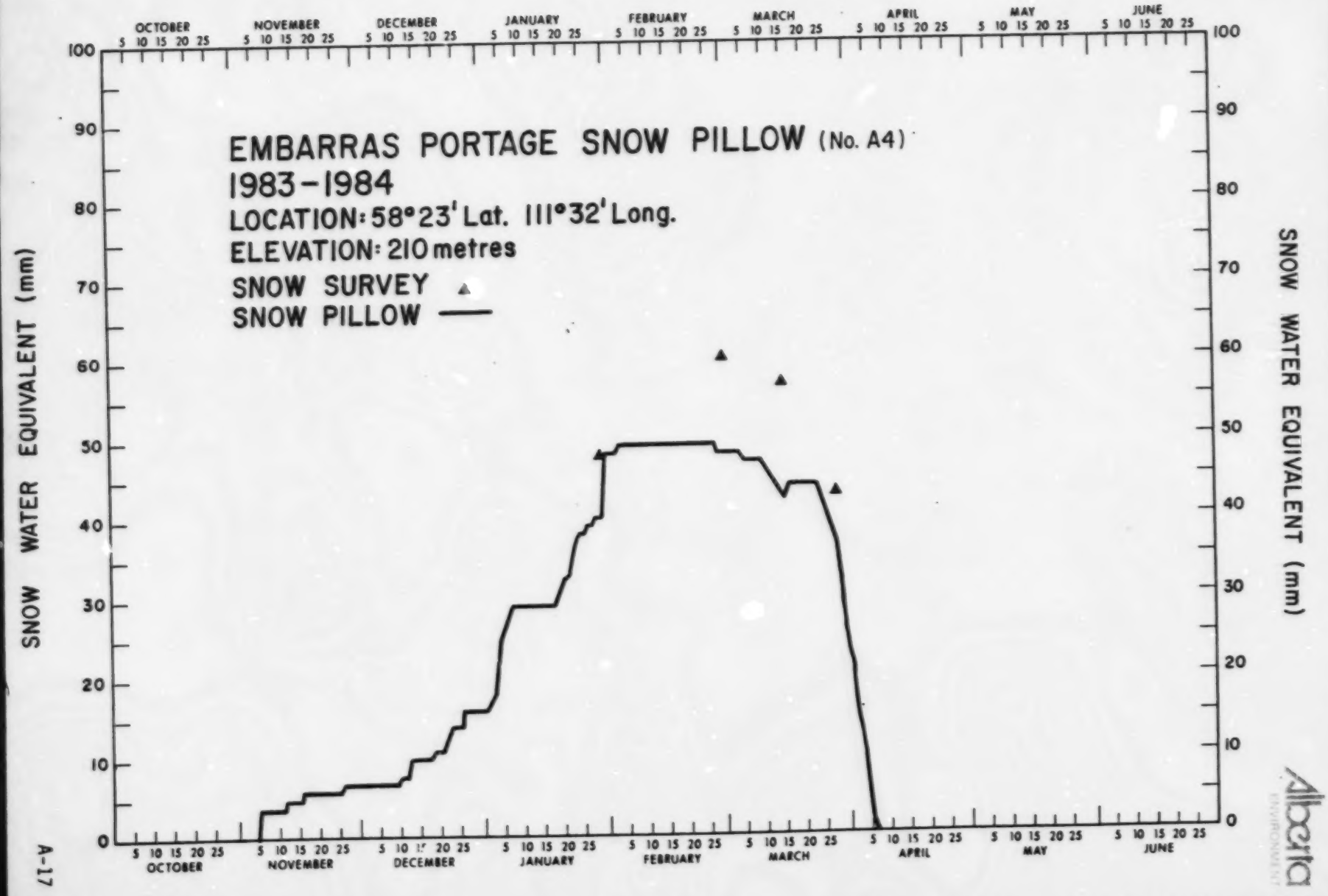
1983 - 1984

NAME	SNOW COURSE NUMBER	DRAINAGE BASIN	ELEVATION (METRES)
Akamina	14Z07	Oldman	1800
Bruce	N 4	N. Saskatchewan	670
Embarras Portage	A 4	Athabasca	210
Fort Chipewyan Airport	A 6	Athabasca	210
Gardiner Headwaters	14Z10	Oldman	1970
Little Elbow Summit	14Y18	Bow	2160
Limestone Ridge	15X06	N. Saskatchewan	1950
Mayerthorpe	A 25	Athabasca	760
Mount Skoki	16X15	Bow	2055
Pipestone *	N 16	N. Saskatchewan	790
Racehorse Creek	14Z08	Oldman	1920
Spring Creek #1	P 10	Peace	720
Spring Creek #2	P 11	Peace	655
Sunshine Village	15X03	Bow	2225
Three Isle Lake	15Y25	Bow	2160
Twin Lakes	A 26	Athabasca	6545

* Because of a malfunction at the Pipestone snow pillow, no plot is available.


AKAMINA SNOW PILLOW (No. 14Z07)
1983–1984
LOCATION: 49°02' Lat. 114°03' Long.
ELEVATION: 1800 metres
SNOW SURVEY ▲
SNOW PILLOW —— '83–'84
..... '82–'83
SNOW WATER EQUIVALENT (mm)
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
0
100
200
300
400
500
600
700
800
900
1000


BRUCE SNOW PILLOW (No.12V02)
1983–1984
LOCATION : 53° 17' Lat. 112° 04' Long.
ELEVATION : 670 metres
SNOW SURVEY ▲
SNOW PILLOW —— '83–'84
SNOW WATER EQUIVALENT (mm)
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
5 10 15 20 25
20
40
60
80
100
120
140
160
180
Alberta
ENVIRONMENT


EMBARRAS PORTAGE SNOW PILLOW (No. A4)
1983-1984
LOCATION: 58°23' Lat. 111°32' Long.
ELEVATION: 210 metres
SNOW SURVEY ▲
SNOW PILLOW —
SNOW WATER EQUIVALENT (mm)
SNOW WATER EQUIVALENT (mm)
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
0
10
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30
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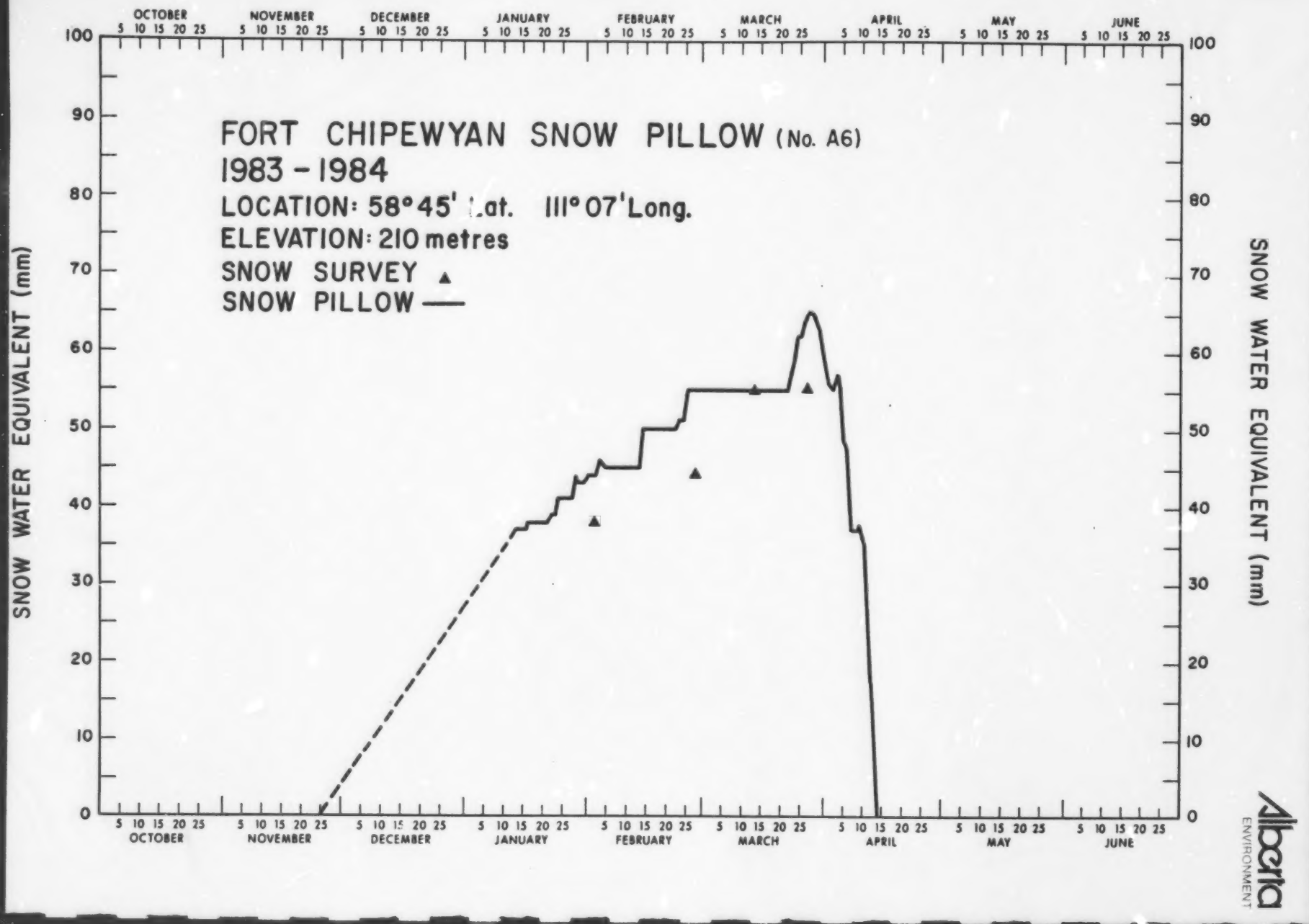
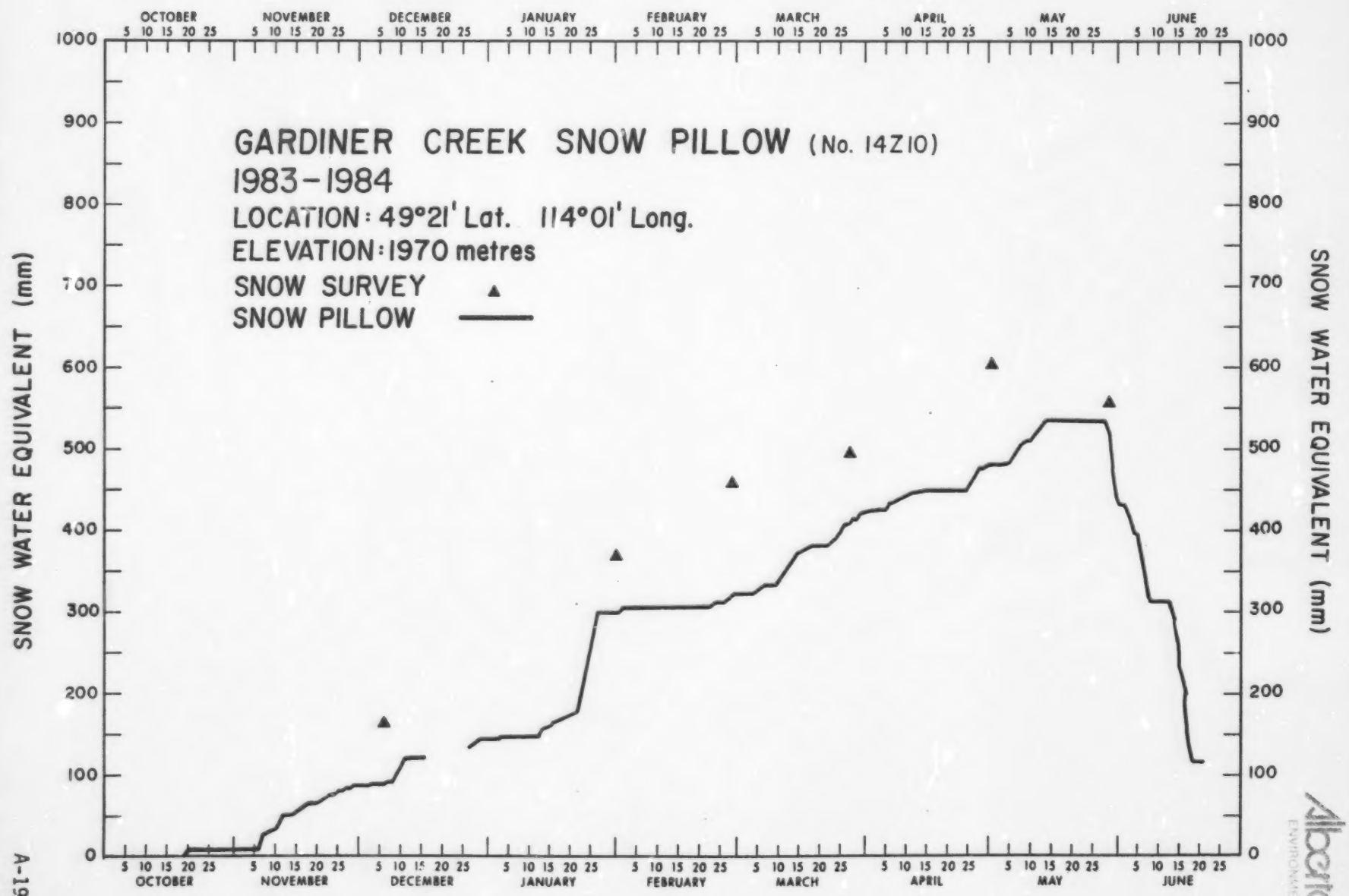
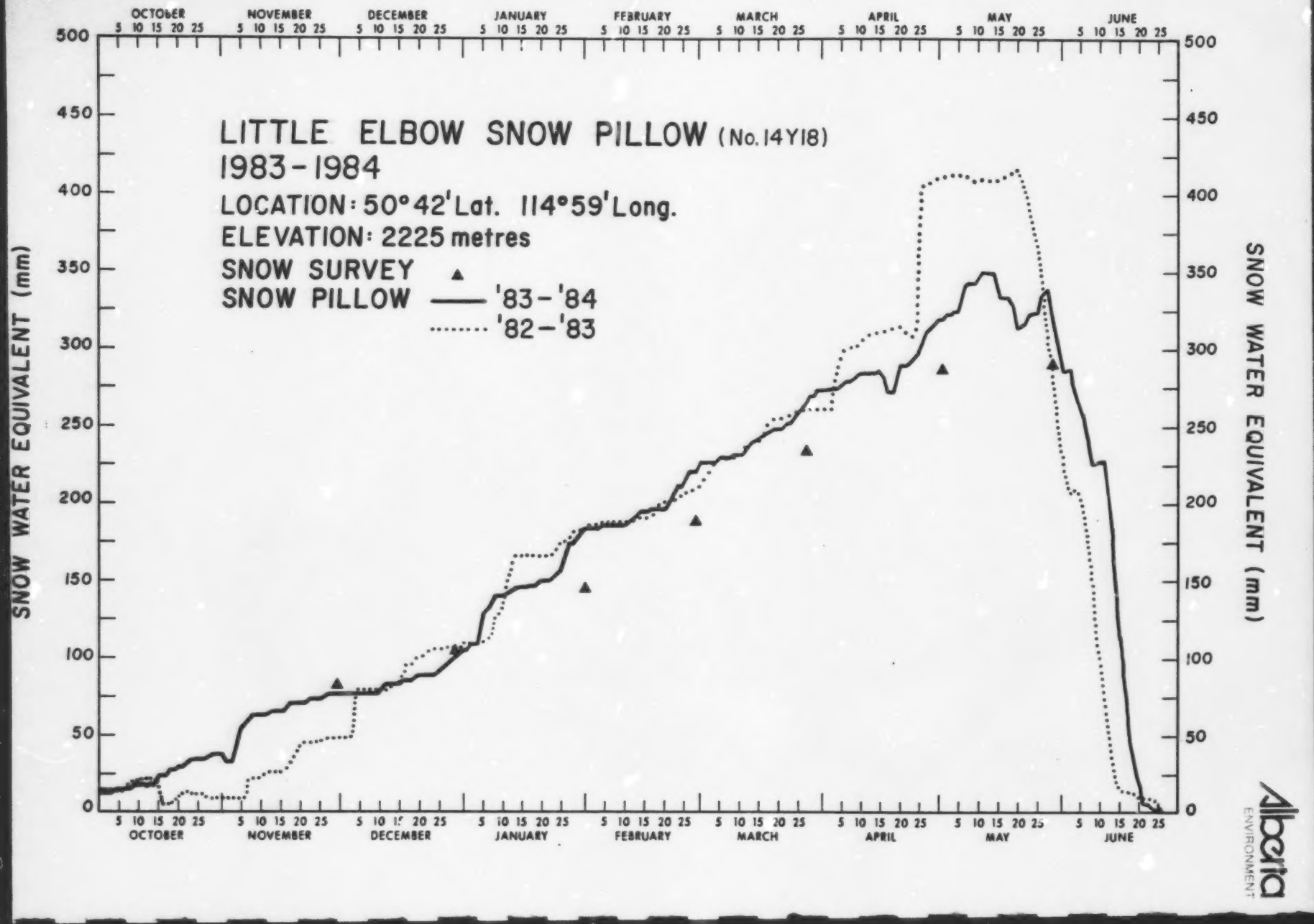
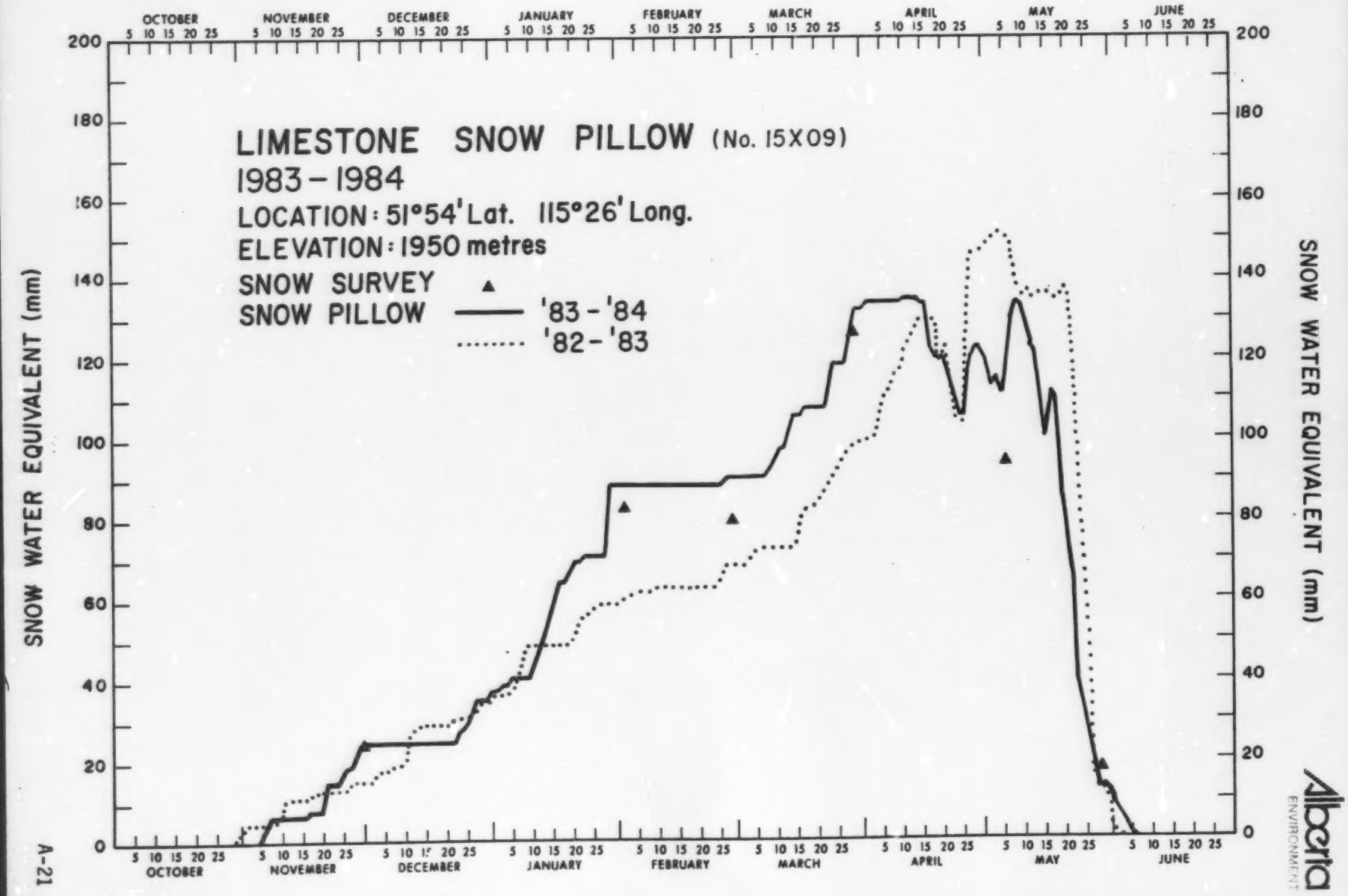
50
60
70
80
90
100

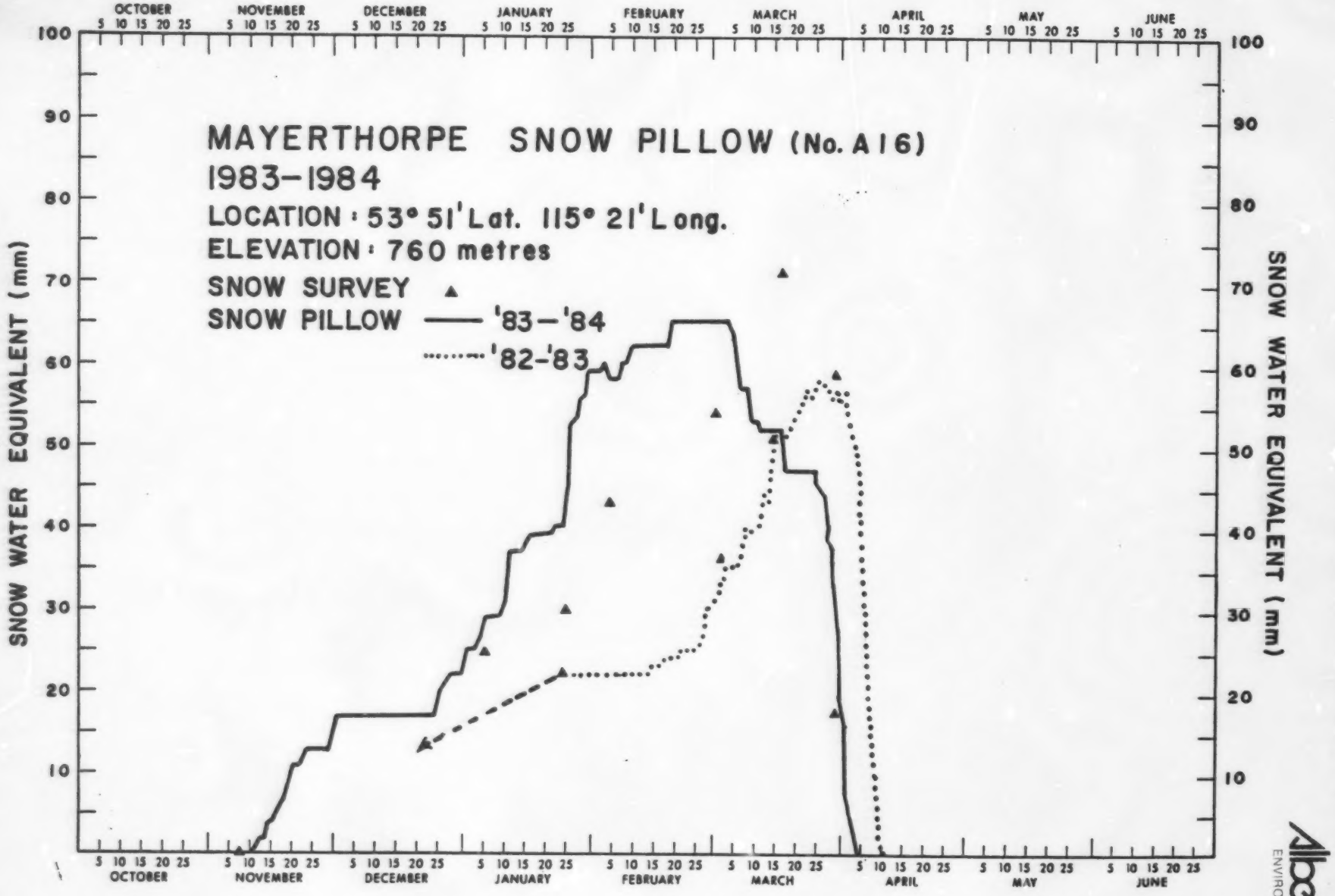

FORT CHIPEWYAN SNOW PILLOW (No. A6)
1983 - 1984
LOCATION: 58°45' Lat. 111°07' Long.
ELEVATION: 210 metres
SNOW SURVEY ▲
SNOW PILLOW —
SNOW WATER EQUIVALENT (mm)
SNOW WATER EQUIVALENT (mm)
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
5 10 15 20 25
0 10 20 30 40 50 60 70 80 90 100
Alberta
ENVIRONMENT


GARDINER CREEK SNOW PILLOW (No. 14Z10)
1983-1984
LOCATION: 49°21' Lat. 114°01' Long.
ELEVATION: 1970 metres
SNOW SURVEY
SNOW PILLOW
SNOW WATER EQUIVALENT (mm)
SNOW WATER EQUIVALENT (mm)
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
0
100
200
300
400
500
600
700
800
900
1000
5 10 15 20 25

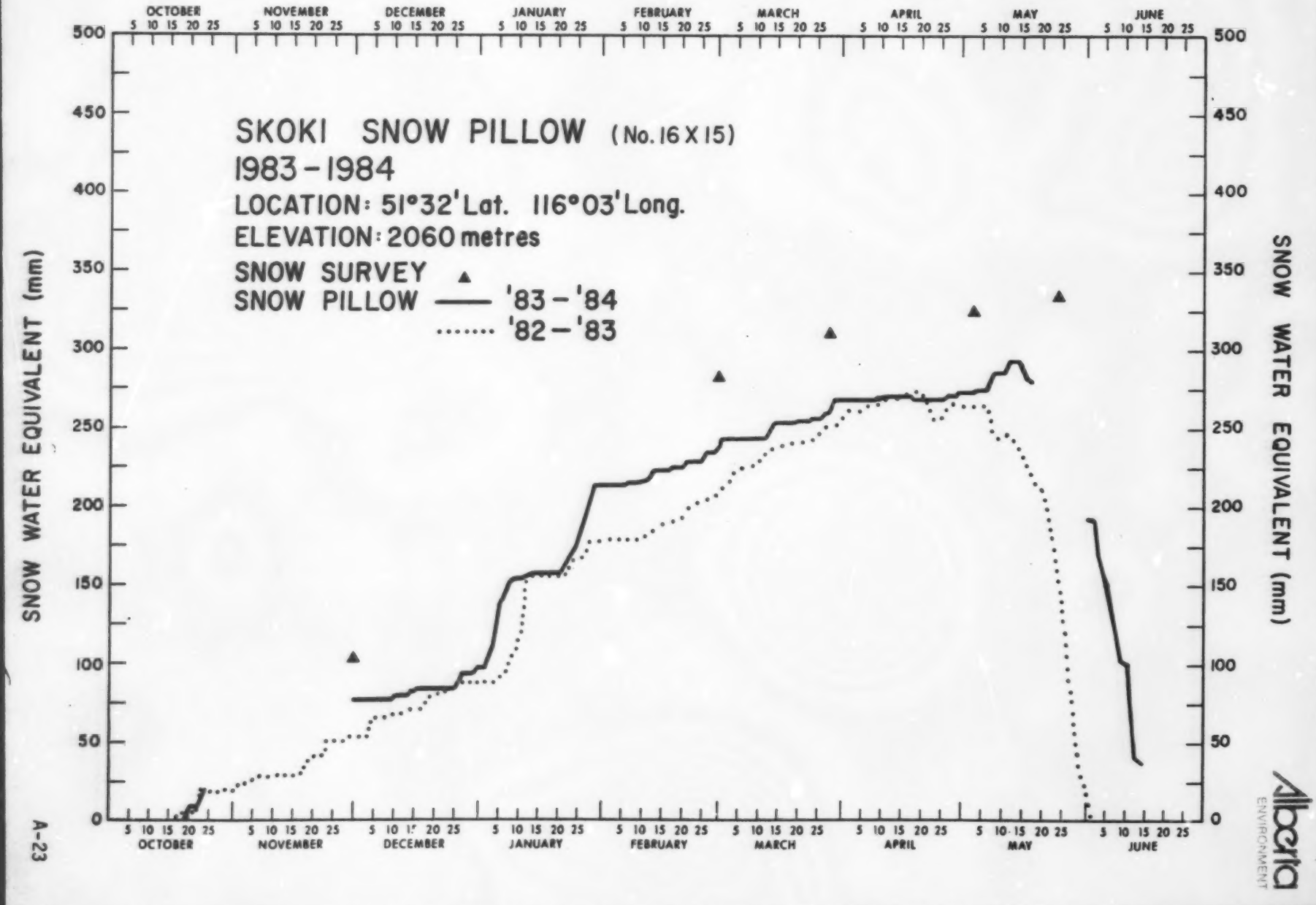


Alberta ENVIRONMENT

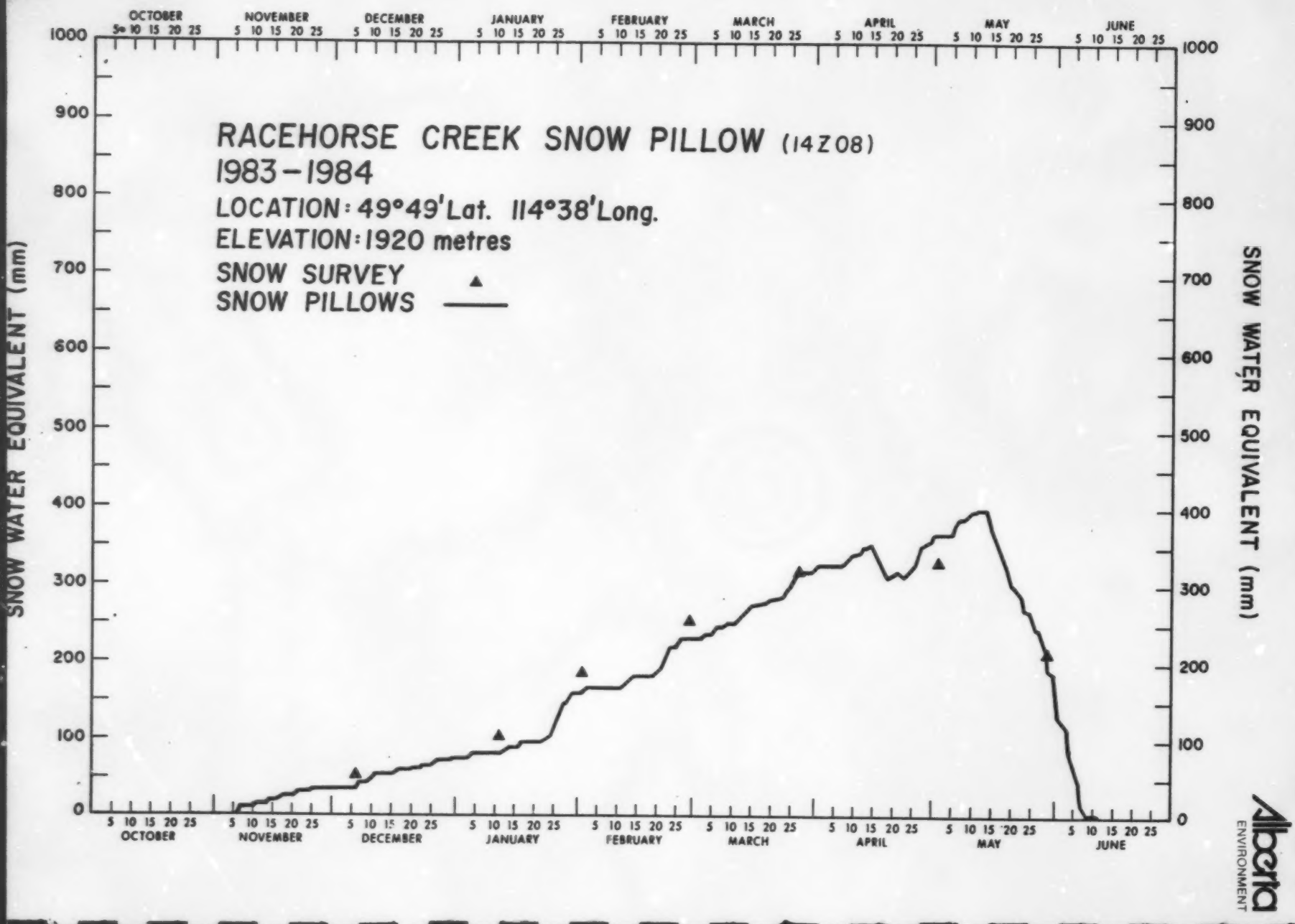

LIMESTONE SNOW PILLOW (No. 15X09)
1983 – 1984
LOCATION: 51°54' Lat. 115°26' Long.
ELEVATION: 1950 metres
SNOW SURVEY ▲
SNOW PILLOW —— '83 - '84
..... '82 - '83
SNOW WATER EQUIVALENT (mm)
SNOW WATER EQUIVALENT (mm)
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
0
20
40
60
80
100
120
140
160
180
200



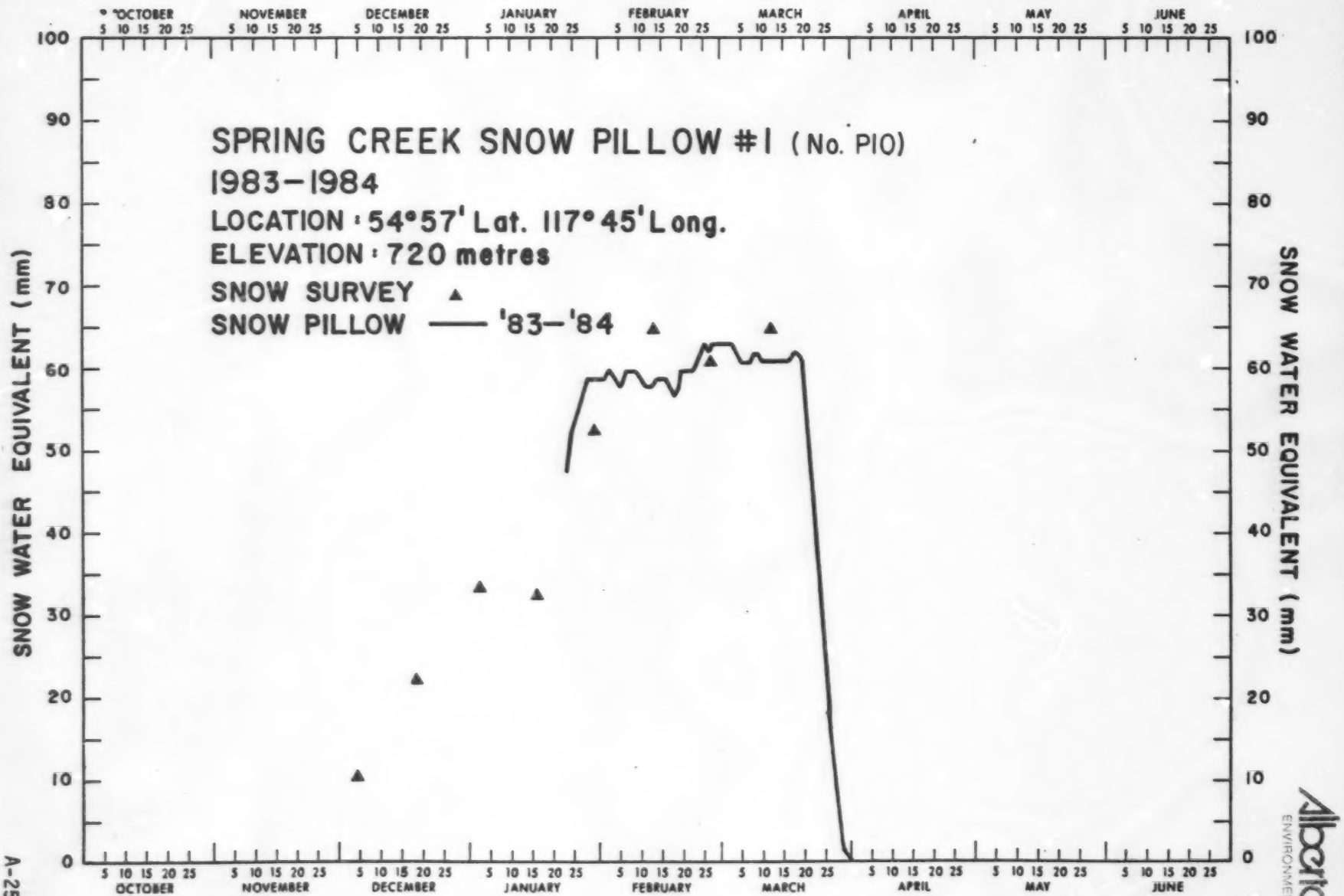
Alberta ENVIRONMENT

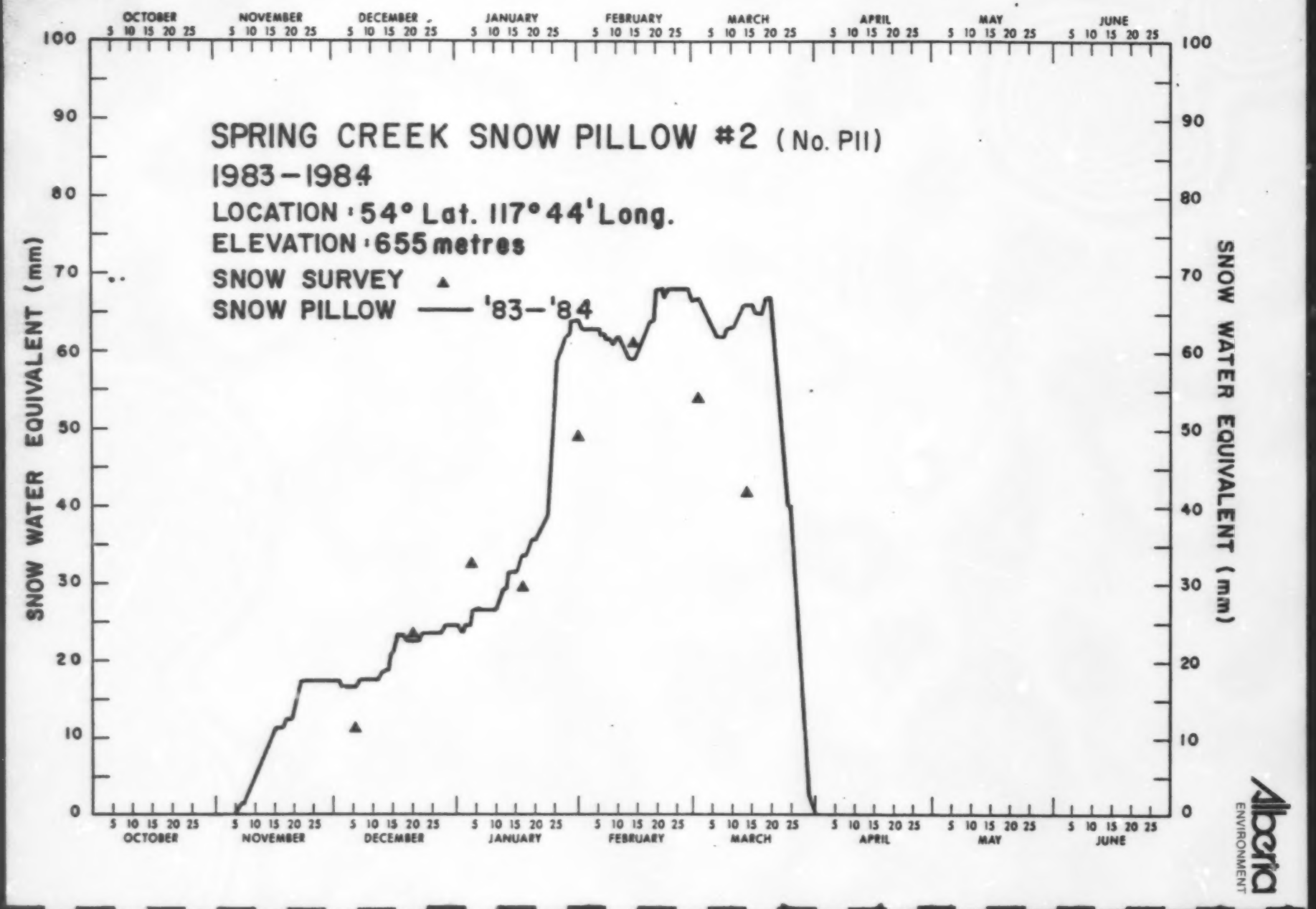


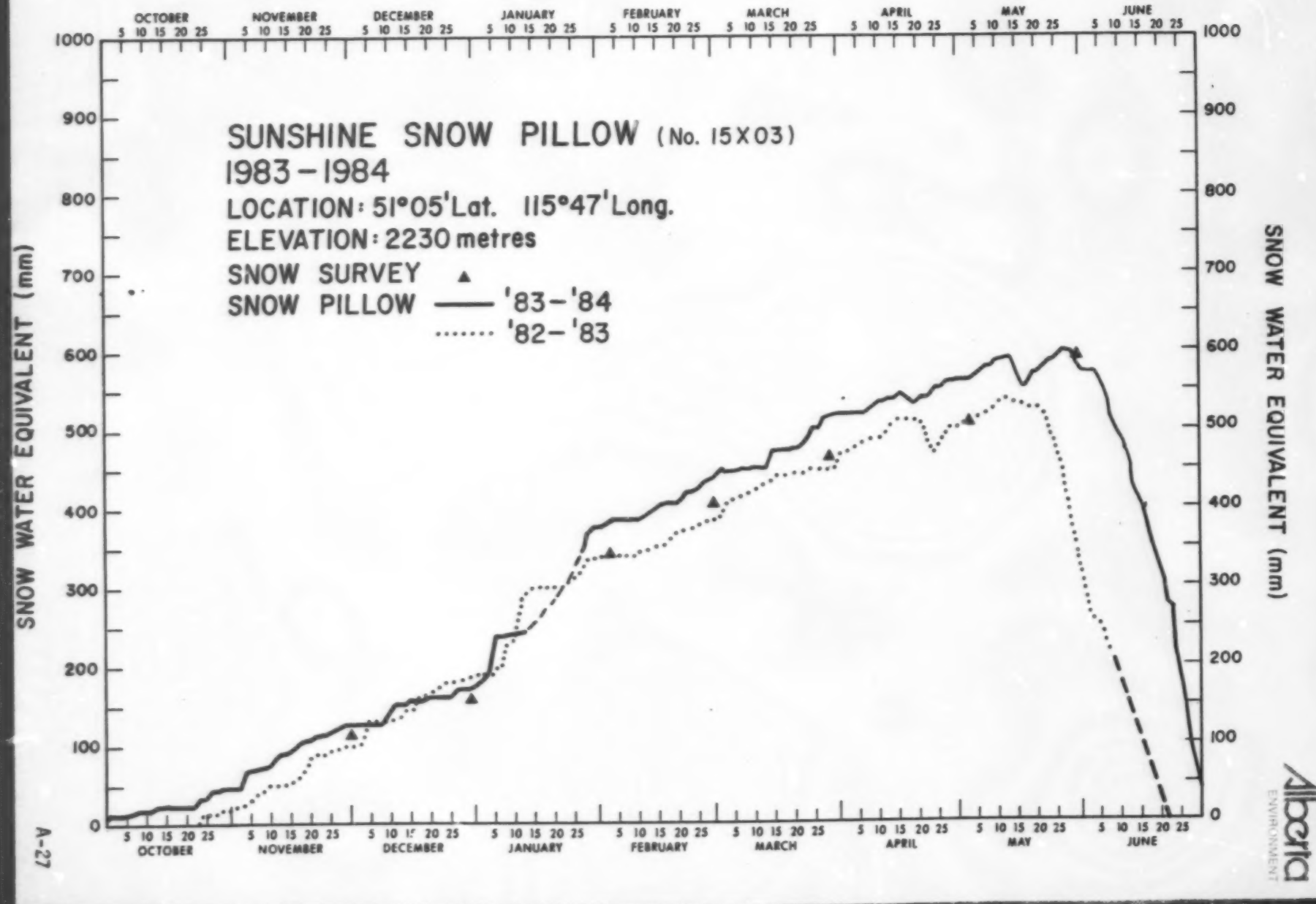
Alberta ENVIRONMENT



Alberta ENVIRONMENT


SPRING CREEK SNOW PILLOW #1 (No. PIO)
1983–1984
LOCATION : 54°57' Lat. 117°45' Long.
ELEVATION : 720 metres
SNOW SURVEY ▲
SNOW PILLOW —— '83–'84
SNOW WATER EQUIVALENT (mm)
SNOW WATER EQUIVALENT (mm)
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
Alberta
ENVIRONMENT


SPRING CREEK SNOW PILLOW #2 (No. PII)
1983–1984
LOCATION : 54° Lat. 117° 44' Long.
ELEVATION : 655 metres
SNOW SURVEY ▲
SNOW PILLOW —— '83–'84
SNOW WATER EQUIVALENT (mm)
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
5 10 15 20 25
0 10 20 30 40 50 60 70 80 90 100
Alberta ENVIRONMENT


SUNSHINE SNOW PILLOW (No. 15X03)
1983 – 1984
LOCATION: 51°05'Lat. 115°47'Long.
ELEVATION: 2230 metres
SNOW SURVEY ▲
SNOW PILLOW —— '83–'84
..... '82–'83
SNOW WATER EQUIVALENT (mm)
SNOW WATER EQUIVALENT (mm)
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
0
100
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700
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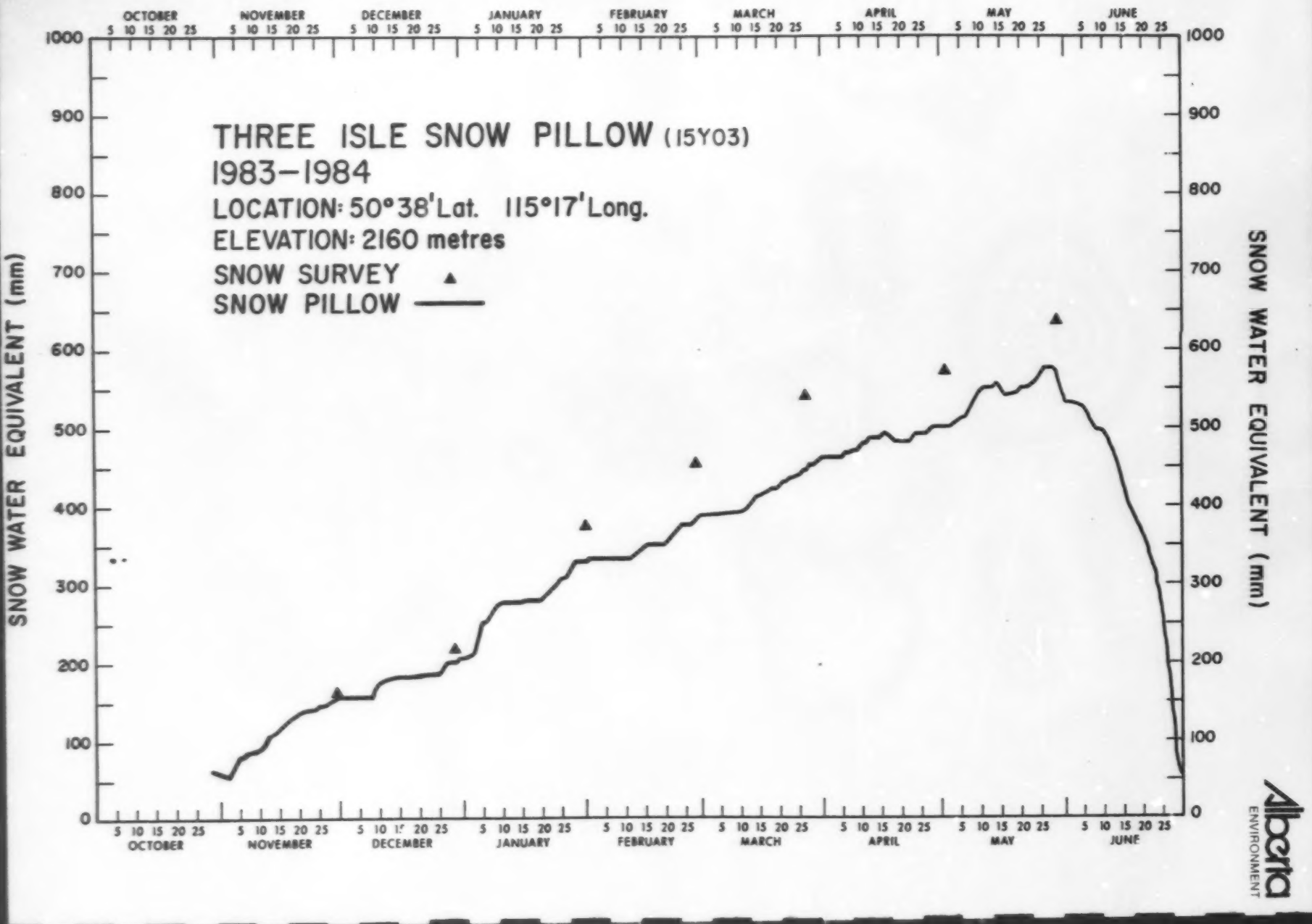
900
1000


THREE ISLE SNOW PILLOW (15Y03)
1983–1984
LOCATION: 50°38'Lat. 115°17'Long.
ELEVATION: 2160 metres
SNOW SURVEY ▲
SNOW PILLOW ——
SNOW WATER EQUIVALENT (mm)
SNOW WATER EQUIVALENT (mm)
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
0
100
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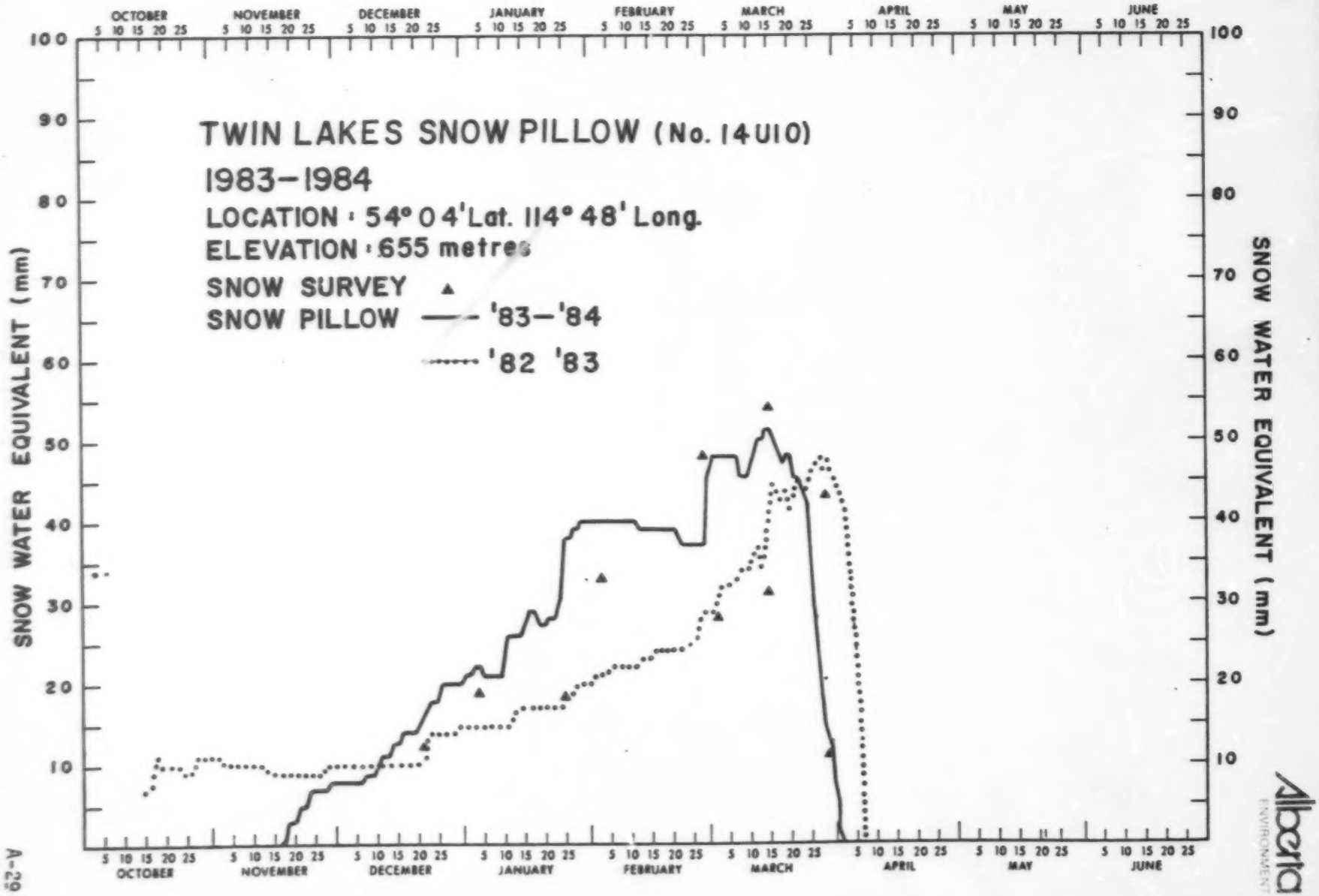
400
500
600
700
800
900
1000
5 10 15 20 25
Alberta
ENVIRONMENT


TWIN LAKES SNOW PILLOW (No. 14U10)
1983–1984
LOCATION : 54° 04' Lat. 114° 48' Long.
ELEVATION : 655 metres
SNOW SURVEY ▲
SNOW PILLOW —— '83–'84
'82 '83
SNOW WATER EQUIVALENT (mm)
SNOW WATER EQUIVALENT (mm)
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
Alberta
ENVIRONMENT

Alberta
ENVIRONMENT

SACRAMENTO STORAGE GAUGE DATA
WINTER PRECIPITATION TOTAL

Gauge No.	Station Name	Date of Reading 1984 (Mo-Day)	83/84 (mm)	82/83 (mm)	Average (mm)
CROWSNEST FOREST RESERVE					
A01	Castle Ranger Station	03-01	139	165	280
		04-01	178	229	321
A09	Carpenter Creek	03-01	N/A	178	212
		04-01	N/A	241	240
A11	Goat Creek	03-01	N/A	394	401
		04-01	445	N/A	457
B10	Crownest Creek	03-01	190	178	270
		04-01	229	229	310
C10	Oyster Creek	03-01	102	102	178
		04-01	130	114	200
C13	Livingstone Gap	03-01	N/A	64	132
		04-01	89	89	152
C16	Racehorse Creek	03-01	368	317	433
		04-01	395	N/A	527
D01	Willow Creek Ranger Station	03-01	N/A	89	140
		04-01	64	89	165
E01	West Porcupine	03-01	N/A	89	79
		04-01	N/A	89	117
BOW RIVER FOREST RESERVE					
G01	Highwood Ranger Station	03-01	50	38	94
		04-01	76	51	122
K01	Canmore Ranger Station	03-01	76	38	94
		04-01	89	57	118
L01	Ghost Ranger Station	03-01	53	51	94
		04-01	76	76	122
M01	Red Deer Ranger Station	03-01	63	25	86
		04-01	89	51	109

All storage gauge data collected with the cooperation of the Alberta Forestry Service.

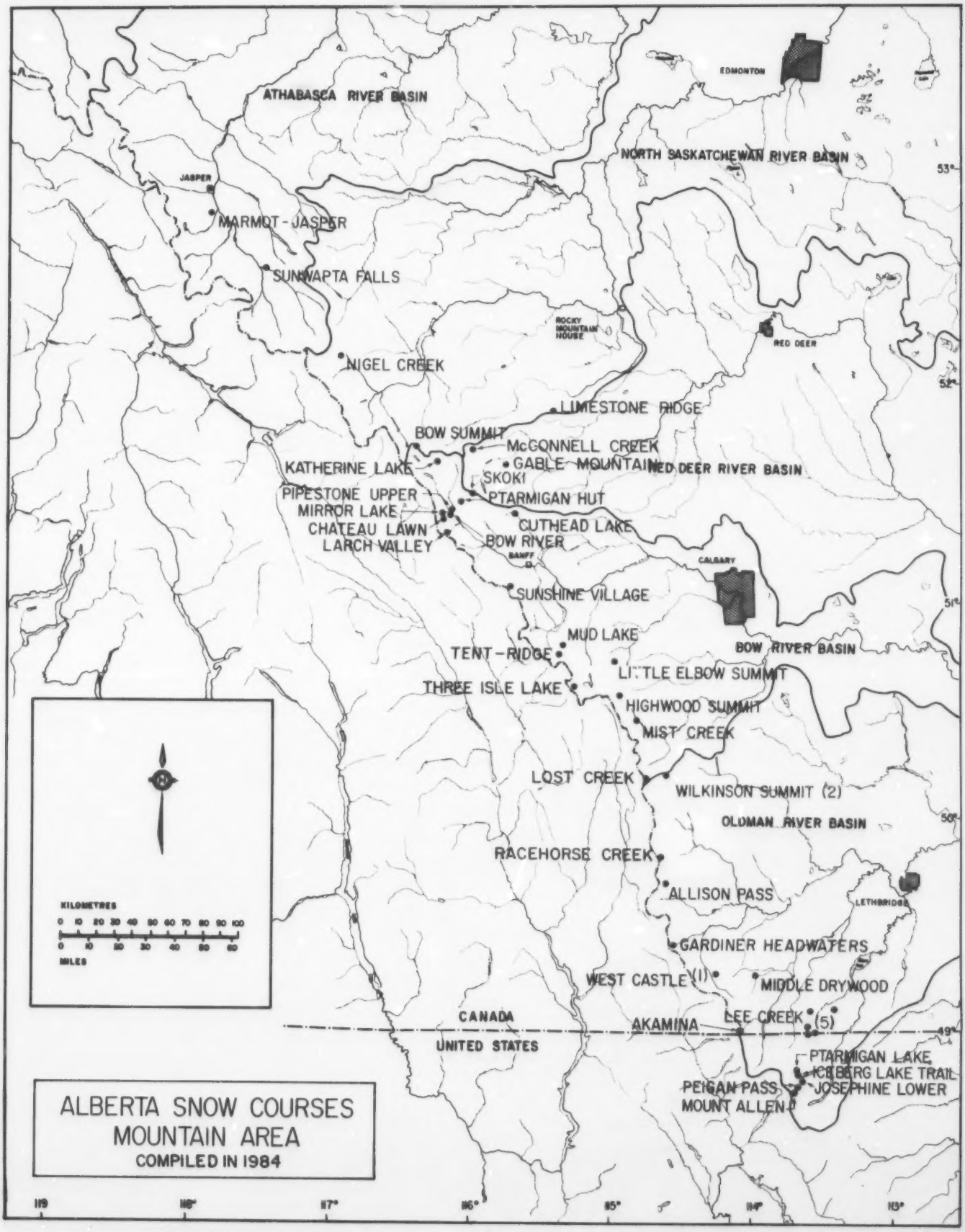
Alberta
ENVIRONMENT

APPENDIX B

INDEX OF

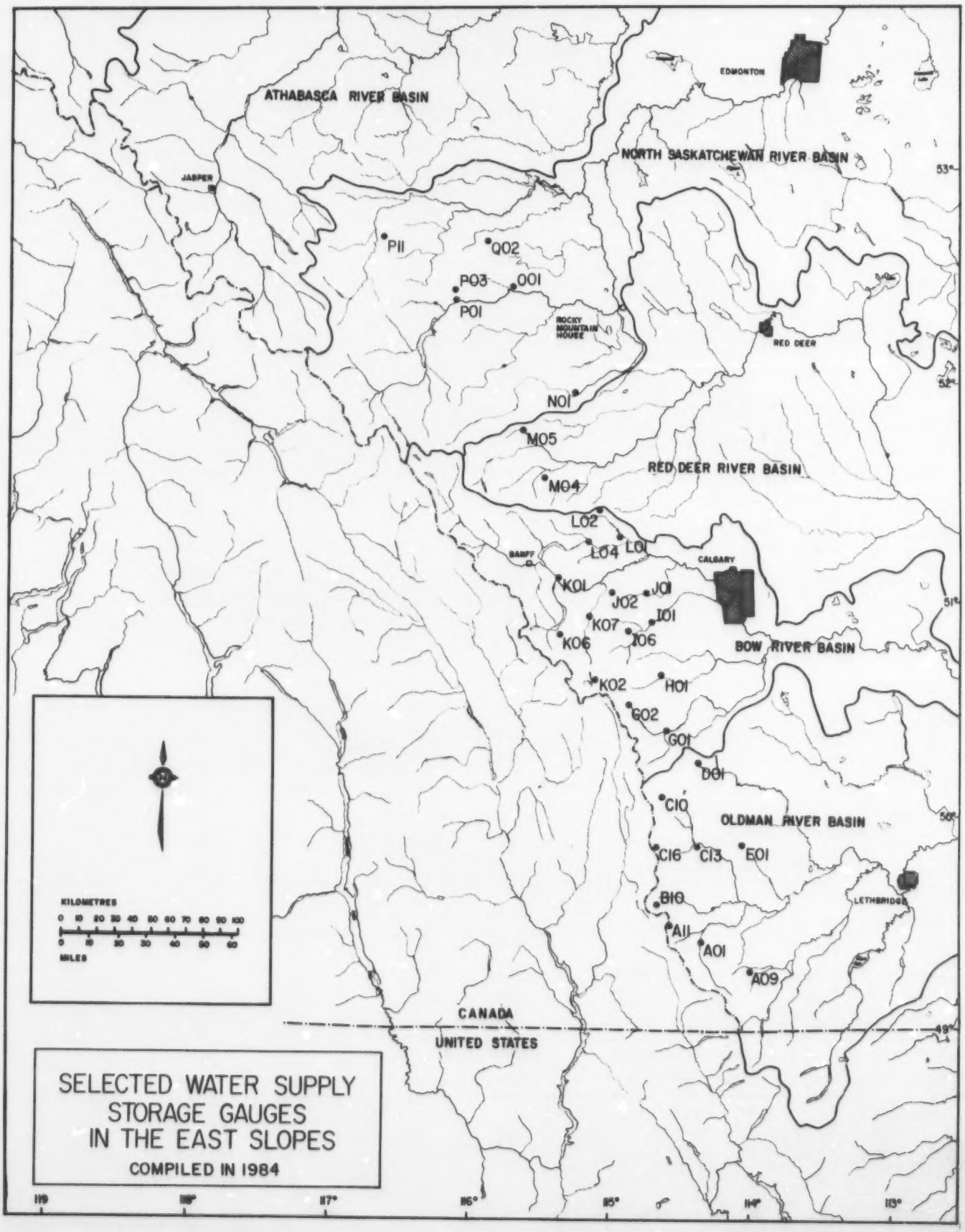
SNOW SURVEY
AND
STORAGE GAUGE LOCATIONS

Alberta
ENVIRONMENT


ATHABASCA RIVER BASIN
EDMONTON
NORTH SASKATCHEWAN RIVER BASIN
JASPER
MARMOT - JASPER
SUNWAPTA FALLS
ROCKY MOUNTAIN HOUSE
RED DEER
NIGEL CREEK
LIMESTONE RIDGE
BOW SUMMIT
McCONNELL CREEK
GABLE MOUNTAIN
KATHERINE LAKE
SKOKI
RED DEER RIVER BASIN
PIPESTONE UPPER
MIRROR LAKE
PTARMIGAN HUT
CHATEAU LAWN
LARCH VALLEY
CUTHEAD LAKE
BOW RIVER
BANFF
CALGARY
SUNSHINE VILLAGE
MUD LAKE
TENT - RIDGE
BOW RIVER BASIN
LITTLE ELBOW SUMMIT
THREE ISLE LAKE
HIGHWOOD SUMMIT
MIST CREEK
LOST CREEK
WILKINSON SUMMIT (2)
OLDMAN RIVER BASIN
RACEHORSE CREEK
ALLISON PASS
LETHBRIDGE
GARDINER HEADWATERS
WEST CASTLE (1)
MIDDLE DRYWOOD
CANADA
AKAMINA
LEE CREEK (5)
UNITED STATES
PTARMIGAN LAKE
ICEBERG LAKE TRAIL
PEIGAN PASS
JOSEPHINE LOWER
MOUNT ALLEN
KILOMETRES
0 10 20 30 40 50 60 70 80 90 100
0 10 20 30 40 50 60
MILES
ALBERTA SNOW COURSES
MOUNTAIN AREA
COMPILED IN 1984
119
118°
117°
116°
115°
114°
113°
53°
52°
51°
50°
49°

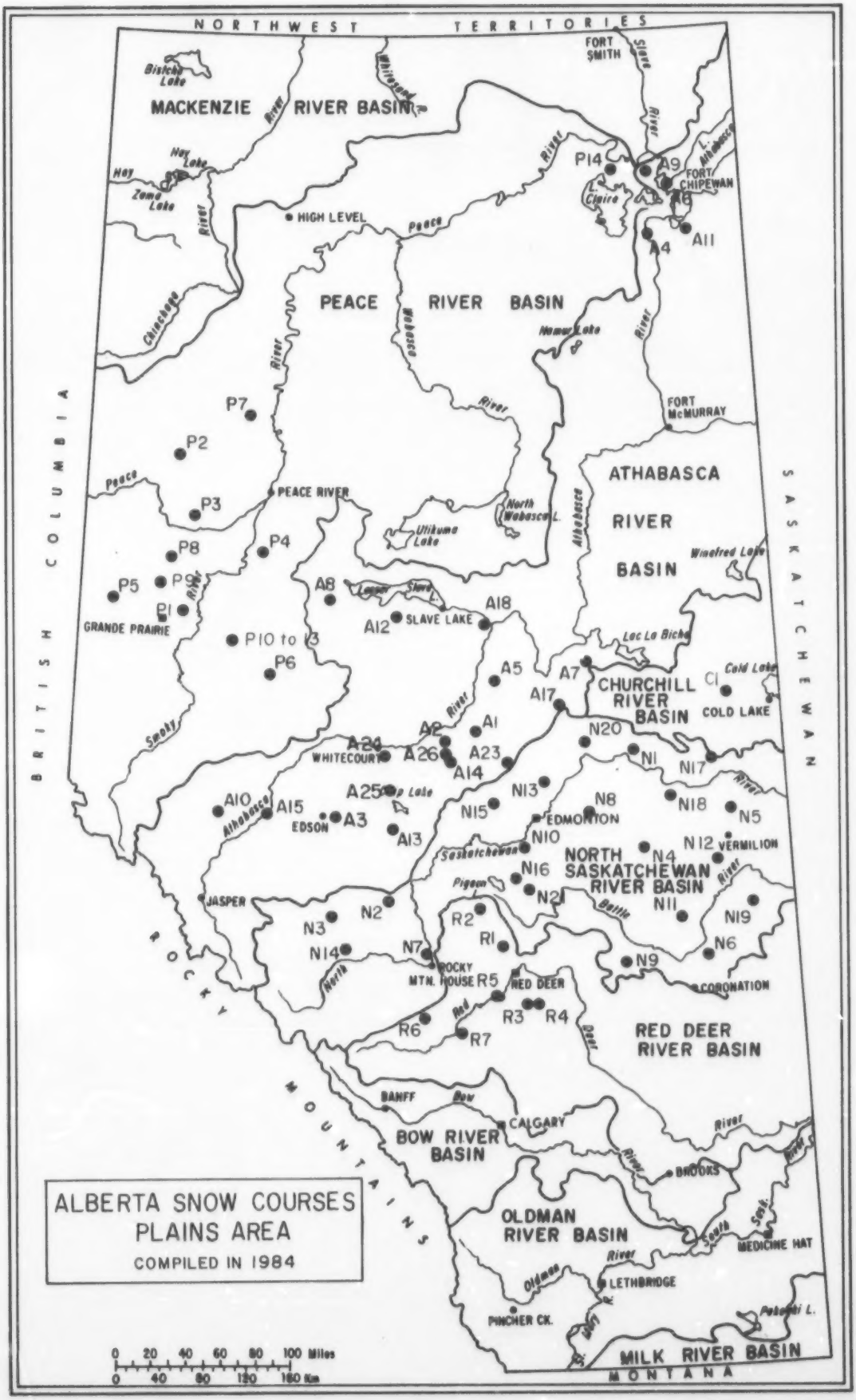
ALBERTA SNOW COURSES
MOUNTAIN AREA

Station Number	Name	Location Lat.	Location Long.	Elevation (m)	Year Established
ATHABASCA RIVER BASIN					
18W02	Marmot-Jasper	52°43'	118°05'	1830	1970
17W01	Sunwapta Falls	52°33'	117°39'	1400	1968
BOW RIVER BASIN					
16X01	Bow River	51°25'	116°11'	1580	1937
16X18	Bow River Summit (II)	51°42'	116°28'	2080	1979
16X08	Chateau Lawn	51°25'	116°13'	1740	1940
15X07	Cuthead Lake	51°27'	115°46'	2210	1979
14Y05	Highwood Summit (Bush)	50°36'	114°59'	2210	1963
16X16	Katherine Lake	51°41'	116°23'	2380	1980
16X14	Larch Valley	51°19'	116°13'	2230	1979
14Y20	Lost Creek	50°10'	114°43'	2160	1983
14Y18	Little Elbow Summit	50°42'	114°50'	2225	1979
16X06	Mirror Lake	51°25'	116°14'	2030	1940
14Y07	Mist Creek	50°31'	114°50'	1790	1965
16X15	Mount Skoki	51°32'	116°03'	2060	1979
15Y21	Mud Lake	50°47'	115°19'	1910	1973
16X02	Pipestone, Upper	51°26'	116°10'	1615	1937
16X09	Ptarmigan Hut	51°28'	116°06'	2190	1967
15X03	Sunshine Village	51°05'	115°47'	2230	1967
15Y24	Tent Ridge	50°51'	115°22'	2025	1981
15Y03	Three Isle Lake	50°38'	115°17'	2160	1981
NORTH SASKATCHEWAN RIVER BASIN					
15X09	Limestone Ridge	51°54'	115°26'	1950	1982
17W02	Nigel Creek	52°12'	117°05'	1920	1968
OLDMAN RIVER BASIN					
14Z07	Akamina	49°02'	114°03'	1800	1980
14Z03	Allison Pass	49°44'	114°36'	1980	1963
14Z10	Gardiner Headwaters	49°21'	114°01'	1970	1983
13Z02	Lee Creek Site D	49°01'	113°37'	1660	1971
13Z03	Lee Creek Site E	49°01'	113°39'	1675	1971
13Z04	Lee Creek Site F	49°03'	113°29'	1570	1971
13Z01	Lee Creek Site P	49°02'	113°34'	1525	1971
13Z08	Lee Creek Site Q	49°03'	113°36'	1500	1971
14Z05	Middle Drywood	49°15'	114°03'	1570	1963
14Z08	Racehorse Creek	49°49'	114°38'	1920	1983
14Z01	West Castle (Bush)	49°19'	114°24'	1520	1967
14Y09	Wilkinson Summit (Bush)	50°12'	114°33'	1980	1963
14Y08	Wilkinson Summit (Open)	50°12'	114°33'	1980	1964
RED DEER RIVER BASIN					
15X05	Gable Mountain	51°38'	115°45'	2150	1981
16X17	McConnell Creek	51°41'	115°59'	2130	1981


ATHABASCA RIVER BASIN
EDMONTON
NORTH SASKATCHEWAN RIVER BASIN
JASPER
53°
P11
Q02
P03
O01
P01
ROCKY MOUNTAIN HOUSE
RED DEER
52°
N01
M05
RED DEER RIVER BASIN
M04
L02
L04
L01
BANFF
CALGARY
K01
J02
J01
I01
K07
I06
K06
BOW RIVER BASIN
51°
K02
H01
G02
G01
D01
C10
OLDMAN RIVER BASIN
50°
C16
C13
E01
LETHBRIDGE
B10
A11
A01
A09
CANADA
UNITED STATES
49°
KILOMETRES
0 10 20 30 40 50 60 70 80 90 100
0 10 20 30 40 50 60
MILES
SELECTED WATER SUPPLY
STORAGE GAUGES
IN THE EAST SLOPES
COMPILED IN 1984
119
118°
117°
116°
115°
114°
113°

ALBERTA FOREST SERVICE
SACRAMENTO STORAGE GAUGE NETWORK

Gauge Number	Name	Location Lat.	Location Long.	Elevation (m)	Year Established
CROWSNEST FOREST RESERVE					
A01	Castle Ranger Station	49°23'	114°21'	1390	1953
A09	Carpenter Creek	49°15'	114°03'	1680	1956
A11	Goat Creek	49°29'	114°34'	1860	1964
B10	Crowsnest Creek	49°36'	114°40'	1460	1954
C10	Oyster Creek	50°07'	114°40'	1830	1955
C13	Livingstone Gap	49°52'	114°20'	1420	1954
C16	Racehorse Creek	49°49'	114°38'	1920	1964
D01	Willow Creek Ranger Station	50°14'	114°21'	1490	1956
E01	West Porcupine	49°51'	114°04'	1450	1953
BOW RIVER FOREST RESERVE					
G01	Highwood Ranger Station	50°23'	114°38'	1490	1953
G02	Mist Creek	50°31'	114°51'	1750	1953
H01	Sheep Ranger Station	50°36'	114°47'	1770	1953
I01	Elbow Ranger Station	50°54'	114°40'	1400	1953
I06	Ford Creek Summit	50°51'	114°53'	1830	1954
J01	Jumpingpound Ranger Station	51°02'	114°44'	1400	1953
J02	Sibbald Creek Summit	51°02'	114°59'	1550	1954
K01	Canmore	51°07'	115°22'	1330	1953
K02	Kananaskis Lakes	50°38'	115°07'	1680	1953
K06	Mud Lake	50°51'	115°21'	1905	1954
K07	Kananaskis Ranger Station	50°54'	115°08'	1510	1954
L01	Ghost Ranger Station	51°20'	114°57'	1370	1953
L02	Mockingbird Lookout	51°25'	115°04'	1905	1963
L04	Ghost Diversion	51°18'	115°08'	1600	1963
M04	Panther River	51°35'	115°28'	1860	1964
M05	Scalp Creek	51°48'	115°39'	2040	1964
CLEARWATER FOREST RESERVE					
N01	Clearwater Ranger Station	51°59'	115°20'	1280	1953
P01	Nordegg Ranger Station	52°29'	116°06'	1370	1953
P03	Shunda Baldy Lookout	52°32'	116°07'	2080	1964
P11	Brown Creek	52°43'	116°45'	1830	1964
Q01	Shunda Ranger Station	52°20'	115°47'	1400	1954
Q02	Atlas Lumber	52°42'	115°27'	1220	1956


NORTHWEST TERRITORIES
MACKENZIE RIVER BASIN
PEACE RIVER BASIN
ATHABASCA RIVER BASIN
CHURCHILL RIVER BASIN
NORTH SASKATCHEWAN RIVER BASIN
RED DEER RIVER BASIN
BOW RIVER BASIN
OLDMAN RIVER BASIN
MILK RIVER BASIN
BRITISH COLUMBIA
SASKATCHEWAN
ROCKY MOUNTAINS
MONTANA
FORT SMITH
HIGH LEVEL
PEACE RIVER
FORT McMURRAY
GRANDE PRAIRIE
SLAVE LAKE
WHITECOURT
EDSON
JASPER
EDMONTON
COLD LAKE
FORT CHIPEWAN
VERMILION
ROCKY MTN. HOUSE
RED DEER
CORONATION
CALGARY
BANFF
BROOKS
MEDICINE HAT
LETHBRIDGE
PINCHER CK.
P1 P2 P3 P4 P5 P6 P7 P8 P9 P10 to 13 P14
A1 A2 A3 A4 A5 A7 A8 A9 A10 A11 A12 A13 A14 A15 A16 A17 A18 A23 A24 A25 A26
R1 R2 R3 R4 R5 R6 R7
N1 N2 N3 N4 N5 N6 N7 N8 N9 N10 N11 N12 N13 N14 N15 N16 N17 N18 N19 N20 N21
ALBERTA SNOW COURSES
PLAINS AREA
COMPILED IN 1984
0 20 40 60 80 100 Miles
0 40 80 120 160 Km

ALBERTA SNOW COURSES
PLAINS AREA

Station Name (#)	Location Lat.	Long.	Elevation (metres)	Year Established	Station Name (#)	Location Lat.	Long.	Elevation (metres)	Year Established
ATHABASCA RIVER BASIN									
Barrhead, North (A1)	54°16'	114°21'	670	1973	Kinuso (A12)	55°20'	115°24'	640	1973
Barrhead, West (A2)	54°11'	114°48'	670	1973	Lodgepole (A13)	53°30'	115°21'	850	1961
Edson (A3)	53°35'	116°14'	910	1973	Mayerthorpe (A25)	53°51'	115°19'	760	1982
Embarras Portage (A4)	58°23'	111°32'	210	1973	Meadowview (A14)	53°59'	114°41'	670	1960
Flatbush (A5)	54°44'	114°06'	640	1973	Obed (A15)	53°34'	117°13'	1090	1973
Fort Chipewyan (A6)	58°45'	111°07'	210	1973	Perryvale (A17)	54°28'	113°10'	670	1973
Grassland (A7)	54°49'	112°41'	570	1973	Saulteaux River (A18)	55°10'	114°14'	570	1973
High Prairie (A8)	55°24'	116°25'	570	1973	Twin Lakes (A26)	54°03'	114°48'	655	1982
Highrock Tower (A9)	58°48'	111°33'	210	1974	Westlock (A23)	54°00'	113°58'	700	1969
Hinton (A10)	53°32'	117°57'	1240	1973	Whitecourt (A24)	54°05'	115°36'	790	1973
Jackfish Village (A11)	58°25'	110°56'	210	1974					
CHURCHILL RIVER BASIN									
Bonnyville, North (C1)	54°30'	110°40'	540	1973					
NORTH SASKATCHEWAN RIVER BASIN									
Bellis (N1)	54°07'	112°05'	671	1973	Manville (N12)	53°10'	111°12'	670	1973
Brazeau (N2)	52°57'	115°41'	970	1977	Morinville (N13)	53°51'	113°29'	700	1973
Brown Creek (N3)	52°46'	116°26'	1340	1977	Nordegg (N14)	52°24'	116°08'	1060	1973
Bruce (N4)	53°17'	112°04'	670	1975	Onoway (N15)	53°43'	114°10'	700	1973
Clandonald (N5)	53°34'	110°52'	640	1973	Pipestone Creek (N16)	53°04'	113°49'	790	1976
Coronation (N6)	52°13'	111°15'	760	1973	St. Paul (N17)	53°59'	111°01'	640	1973
Crimson Lake (N7)	52°25'	115°02'	970	1973	Two Hills (N18)	53°43'	111°43'	640	1973
Elk Island National Park (N8)	53°35'	112°50'	700	1973	Wainwright (N19)	52°43'	110°37'	670	1973
Gadsby (N9)	52°19'	112°23'	790	1973	Waskatenau (N20)	54°11'	112°50'	640	1973
Leduc (N10)	53°16'	113°33'	730	1973	Wetaskiwin (N21)	52°59'	113°38'	790	1973
Lougheed (N11)	52°40'	111°33'	670	1973					
PEACE RIVER BASIN									
Bezanson (P1)	55°14'	118°31'	700	1973	Rycroft (P8)	55°42'	118°44'	640	1973
Eureka River (P2)	56°31'	118°44'	700	1973	Sexsmith (P9)	55°27'	118°53'	850	1973
Fairview (P3)	56°03'	118°24'	640	1973	Spring Creek Watershed Site #1 (P10)	54°57'	117°51'	710	1967
Girouxville (P4)	55°46'	117°20'	570	1973	Spring Creek Watershed Site #2 (P11)	54°55'	117°45'	650	1967
Hythe (P5)	55°19'	119°34'	760	1973	Spring Creek Watershed Site #3 (P12)	54°57'	117°41'	730	1967
Little Smoky River (P6)	54°44'	117°09'	670	1973	Spring Creek Watershed Site #4 (P13)	54°55'	117°41'	730	1967
North Star - Manning (P7)	56°52'	117°38'	480	1973	Sweetgrass (P14)	58°51'	112°00'	210	1977
RED DEER RIVER BASIN									
Bentley (R1)	52°29'	114°04'	910	1973	Dickson (R5)	52°05'	114°10'	910	1973
Hoadley (R2)	52°49'	114°23'	970	1972	James River (R6)	51°54'	115°00'	1210	1973
Knowhill Valley (R3)	52°00'	113°42'	970	1973	Sundre (R7)	51°47'	114°31'	1060	1973
Innisfail (R4)	52°01'	113°35'	910	1973					